Research article

Telenutrition Education on Weight Loss and Improved Dietary Patterns among Myanmar Adults

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ABSTRACT

This study examined the effectiveness of a telenutrition education program based on the proven Group Lifestyle Balance (GLB) protocol in promoting weight management and improving dietary patterns among overweight and obese adults in Myanmar. A pretest-posttest study was conducted among a single group of participants who had no underlying conditions. Twelve weekly nutrition sessions were held in a group setting using a telenutrition platform. Data on body weight, dietary intake, and physical activity level were collected at the end of the first and eleventh weeks. Out of 28 participants, five dropped out due to health and occupational issues. Results showed that participants achieved an average of 6.7% reduction in body weight. Regarding the diversity of food group choices, a significant improvement in the Food Group Diversity Score (FGDS) from 3.62 (SD, 0.98) to 5.18 (SD, 0.97) was evident. Moreover, the average duration of physical activity per week increased from 147.17 minutes (SD, 134.79) to 331.90 minutes (SD, 341.32). While there was no significant increase in fruit or vegetable portion intakes, participants tended to consume wider varieties of these foods according to the FGDS score. In addition, though not statistically significant, a mean reduction of 3.58 g in saturated fat intake was found. Consequently, implementing a telenutrition platform to deliver the GLB program shows potential as an effective approach for assisting overweight and obese adults in Myanmar in achieving weight loss within a feasible timeframe.

Key words: Obesity; Lifestyle Intervention; Telenutrition; Group Lifestyle Balance

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INTRODUCTION

Primary healthcare was confronted with numerous challenges during the COVID-19 pandemic, including insufficient personal protective equipment, the implementation of lockdown measures, and the risk of infection transmission to both patients and healthcare professionals[1]. Certain risk factors, including advanced age, cardiovascular disease, diabetes, chronic respiratory disease, hypertension, aggressive malignancy, and obesity, contribute to increased susceptibility to COVID-19 infection and mortality[2,3]. In Myanmar, the prevalence of overweight and obesity among adults has increased from 14.8% and 2.1% in 2001 to 26.8% and 7.2% in 2019, respectively. The escalation in obesity rates further exacerbates morbidity and mortality associated with COVID-19[4]. To address these challenges and enhance accessibility, telenutrition emerged as a promising strategy for delivering comprehensive nutrition programs especially to remote areas[5]. Telenutrition involves registered dietitians remotely providing nutritional treatment to patients or clients using electronic communication and information technologies[6]. Numerous studies have demonstrated significant benefits of telenutrition interventions conducted through video conferencing or online messaging to promote weight reduction[7,8]. Various technologies can be utilised for telenutrition interventions, including online chat rooms, text messaging, email, smartphone apps for self-monitoring, interactive video conferencing, phone calls, and web-based platforms[9]. Both online and offline weight reduction and lifestyle interventions have proven effective in preventing and managing chronic diseases such as type 2 diabetes mellitus and cardiovascular diseases. A modest weight loss of 5-10% of body weight can lead to a reduction of 10-15% in the risk of cardiovascular disease[10]. Successful weight reduction is dependent not only on calorie reduction but also on increased and sustained physical activity. The Group Lifestyle Balance (GLB) program is a comprehensive lifestyle intervention that combines persistent physical exercise, moderate calorie restriction, and behavioural techniques to achieve sustainable weight loss over the long term[11]. This approach is adapted directly from the individual management of the Diabetes Prevention Program (DPP) Lifestyle intervention. The effectiveness of the GLB program has been demonstrated to be comparable to that of the DPP lifestyle program in terms of weight reduction, adoption of a healthy diet, improvement in exercise habits, management of blood glucose levels, and enhancement of health-related quality of life[11]. Moreover, studies have shown that some ethnic groups, such as Chinese Americans, have benefited from the GLB program[12]. In trials lasting for a 12-week period, the implementation of the GLB regimen resulted in an average weight reduction of 3 to 7%[11,12,13]. Obesity and its associated health-related problems are highly prevalent in Myanmar, mirroring the global trend of increasing obesity rates. In light of these circumstances, telenutrition has the potential to serve as both an immediate response to the epidemic and a long-term strategy for addressing nutritional care in Myanmar. However, the effectiveness of telenutrition education programs specifically designed for weight loss among the Burmese community has not been previously studied. Consequently, this study's aim was to

investigate whether a telenutrition education program based on the GLB protocol could effectively assist overweight and obese adults in Myanmar in managing their weight and making changes to their dietary patterns.

METHODS

Ethical statement

The study was conducted in accordance with the guidelines laid down in the Declaration of Helsinki and all procedures involving participants were approved by the Mahidol University Central Institutional Review Board (MU-CIRB no. 2022/065.0706). Prior to their participation, all participants were provided with comprehensive information regarding the nature, objectives, and duration of the intervention. Written informed consent was obtained from each participant after they had decided to participate in the study. The study protocol was registered with the Thai Clinical Trials Registry (TCTR) under the registration number TCTR20230508001 (https://www.thaiclinicaltrials.org/export/pdf/TCTR20230508001).

Study Design

A non-randomized, pretest-posttest study was conducted among adults in Myanmar as a single-group intervention. The total duration of the intervention was 12 weeks. Recruitment of participants took place between June and July 2022 through phone calls, email communication, and advertisements on social media platforms. Potential candidates were selected using simple random sampling. Sociodemographic data and willingness to participate, based on the inclusion and exclusion criteria, were collected through an online screening form. The inclusion criteria encompassed Myanmar adults aged between 20 and 55, with a body mass index (BMI) equal to or greater than 25 kg/m^2, access to a smartphone, laptop, or tablet, and proficiency in using the internet, email, and video-conferencing platforms. Individuals with certain medical conditions, including diabetes mellitus, cardiovascular diseases, hypertension, cancer, renal disease, hepatic disease, pulmonary disease, gastrointestinal disease, endocrine disorders, or major psychotic disorders, were excluded from the study. Pregnant or lactating individuals, those currently participating in any weight loss program, and those who had lost more than 10% of their body weight in the previous six months were also excluded.

Materials

The Group Lifestyle Balance (GLB) protocol, developed by the University of Pittsburgh, was utilised for this study. The core curriculum scripts and relevant materials were obtained from the University of Pittsburgh Diabetes Prevention Support Centre[14]. Each week, participants received chapter-by-chapter handouts and a self-monitoring booklet via email or other channels such as Google Drive or Telegram. Additionally, a food exchange list was given for respective weeks. The study's researcher also followed the instructor's script in the "DPP Group Lifestyle Balance Leaders Guide"[15].

Interventions

The study consisted of 12 weekly sessions including dietary and physical activity interventions (details in **Table 1**). Sessions took place on every Sunday of each week. Participants recorded their data on the following

Table 1. Weekly session topics in accordance with the Group Lifestyle Balance core curriculum

Session	Details of the session
1. Welcome to the telenutrition education program	Build commitment to the lifestyle change program by recording personal reasons for joining the program and perceived benefits to self, family, and others. Highlight the two study goals: 7% weight loss and 150 minutes of weekly physical activity.
2. Be a calorie detective	Focus on finding the main sources of dietary fat by monitoring fat grams using the “Food Exchange Table” & by reading food labels.
3. Healthy eating	Discuss eating patterns and introduce the USDA’s “My Plate” as a model for healthy eating. Emphasize low-fat, low- calorie foods and serving size and how to choose healthier fats.
4. Move those muscles	Introduce physical activity and benefits of active lifestyle. Discuss building to 150 minutes of activity over the next 4 weeks. Discuss safety issues.
5. Tip the calorie balance	Teach the fundamental principle of energy balance and what it takes to lose 0.5-1 kg per week.
6. Take charge of what’s around you	Introduce the principle of stimulus control. Identify cues in the participant’s home environment that leads to unhealthy food and activity choices and discuss ways to change them.
7. Problem solving	Present the five-step model of problem solving. Apply the problem-solving model to eating and exercise problems.
8. Four keys to healthy eating out	Introduce four basic skills for managing eating away from home: anticipating and planning, positive assertion, stimulus control, and making healthy food choices.
9. The challenge of changing your lifestyle	Teach participants to recognize personal triggers for slips, identify their reactions to slips, replacing negative thoughts with positive self-talk, and getting back on track.
10. Step up your physical activity plan	Introduce the basic principles of aerobic fitness: frequency, intensity, time, type of activity (FITT). Discuss ways to cope with boredom by adding variety to the physical activity plan.
11. Make social cues work for you	Present strategies for managing problem social cues and help participants learn to use social cues to promote healthy behaviours, e.g., how to manage when being pressured to eat more.
12. Ways to stay motivated	Introduce strategies for staying motivated including posting signs of progress, setting new goals, creating friendly competition, and others.

days of the same week and then submitted their weekly data before the next Sunday session. Consequently, up to the 11th week, participants submitted their monitoring records for food diary, physical activity, and body weight weekly. The 12th session addressed how to keep their motivation sustained and get on track for the long term. Participants did not need to record their data after attending the last session on the Sunday of the 12th week. The following goals were pursued across all topics: achieving a 7% weight loss from baseline, increasing physical activity to 150 minutes per week of moderate intensity, reducing fat intake to less than 25%, reducing saturated fat intake to less than 10% of total energy intake, and consuming 5 portions of fruits and vegetables daily.

Dietary intervention

Participants were contacted via video conference once a week for 45-60 minutes as needed. They were recommended to achieve a daily caloric deficit of 2092-4184 Joules (kJ) in order to achieve a weight loss of 0.5-1 kg per week. The GLB program employed four standard calorie levels based on participant weight: (i) 5020.8 kJ per day and 33 grams of fat for participants weighing 54.4 to 78.9 kg (120-174 lb); (ii) 6276 kJ per day and 42 grams of fat for those weighing 79.4 to 99.3 kg (175-219 lb); (iii) 7531.2 kJ per day and 50 grams of fat for those weighing 99.7 to 112.9 kg (220-249 lb); and (iv) 8368 kJ per day and 55 grams of fat for those weighing 113.3 kg (250 lb) or more. During core sessions, participants were shown how to calculate, search for, and document their calorie, fat, and food intake. They were advised to maintain food records in a self-monitoring booklet, recording their intake for two non-consecutive weekdays and one weekend day per week. The layout of the record booklet was similar to the GLB program's Keeping Track Booklet[16]. At the end of each week, the researcher estimated the amount of fat and calories based on the participants' food records and provided them with the results for self-reflection. The food records also included the time of consumption, the name of the food, each participant's estimated portion size using household utensils or a measuring scale, and a description of the ingredients and cooking methods employed.

Physical activity intervention

The prescribed physical activity requirements for the first week were set at 60 minutes per week, and then gradually increased by 30 minutes per week until reaching a target of 150 minutes per week by the fourth week. Individual considerations were taken into account for participants who desired or were already engaging in higher activity levels. If it was determined that they had the necessary fitness, they were allowed to exceed the target. It was also emphasized that short episodes of a physical activity could be spread out through the week to achieve the desired goals. Although participants were advised about the health benefits of these activities, daily non-exercise physical activities, such as cleaning, gardening, and climbing stairs, were not specifically documented. Participants were instructed to gauge the intensity of their exercises based on their heart rate or Borg's rate of perceived exertion. They were provided with a self-monitoring booklet to record the total amount of physical activity performed each day and measured in minutes.

Weight and height measurements

Participants were given detailed instructions on how to measure their weight and height. To facilitate the process, participants were reimbursed for the cost of a digital weighing scale. They were instructed to update their weight measurements once a week on the same day of the week (e.g., every Friday morning), at the same time of day, using the same weighing scale. To maximize weight measurement accuracy, participants were advised to measure their weight at home, barefoot, standing straight with eyes open on the Frankfort plane, wearing light clothing, and after emptying their bladder. Body weight was recorded to the nearest 0.1 kg, and participants were advised to calibrate the scale to zero before use. For height measurement, participants were instructed to remove their footwear and stand straight with their eyes fixed on the Frankfurt plane while measuring their height at home. The self-reported height was used as the baseline for the study.

Dietary assessment

To assess calorie intake, fruit and vegetable consumption, and saturated fat intake, three-day food records were collected from participants at the end of the first and eleventh weeks. These records were analysed to determine macronutrient intake, energy intake, and the amount of saturated fat using the INMUCAL-Nutrient software program version 4.0[17]. For certain foods that lacked nutrient profiles in this software program, information in the Indian Food Composition Tables were used[18]. Dietary patterns were evaluated using the Food Group Diversity Score (FGDS), which was calculated in accordance with the Diet Quality Questionnaire Indicator Guide[19]. A scoring system was utilised to assess dietary diversity based on ten specific food groups. Each food group was assigned a score of 1 or 0, including grains, white roots and tubers, and plantains; pulses (beans, peas, and lentils); nuts and seeds; dairy; meat, poultry, and fish; eggs; dark green leafy vegetables; other vitamin A-rich fruits and vegetables; other vegetables; and other fruits. The Food Group Diversity Score (FGDS) for a single-day food record was calculated by summing the scores for these ten food groups, resulting in a score ranging from 0 to 10. To determine each participant's average FGDS, the scores were calculated based on the three-day food records.

Statistical analysis

Sample size

The sample size calculation for this non-randomized pretest-posttest study was based on the application of the DPP Group Lifestyle Balance protocol over 12-week sessions[12]. As the standard deviation of the mean difference in the reference was absent, it was estimated using a correlation coefficient of 0.95 derived from similar studies[13,20]. A sample size of 20 was determined to be necessary to detect a mean difference of 5.4% in weight loss at the end of the intervention, with 95% power and a type 1 error of 5%. Accounting for a dropout rate of 40%, a total of 28 participants were recruited.

Data analysis

Statistical analysis was performed using the SPSS version 18.0 software program (IBM Corp., Armonk, NY, USA). Data were expressed as means (standard deviations) or number (percentages). A two-tailed *P*-value of less than 0.05 was considered statistically significant. The

distribution of the data was assessed using the Shapiro-Wilk test. For normally distributed continuous data, a paired-sample *t*-test was used to detect significant changes from baseline to the endpoint. In cases where data were not normally distributed, the Wilcoxon signed-rank test was employed. To determine significant weight reduction between successive weeks, a repeated-measures ANOVA was carried out with post hoc Bonferroni correction. Analyses were conducted using a per-protocol analysis where data recorded in the first week were used as the baseline and data recorded at the end of the 11th week were considered as post-test data. Beyond the 12th week, the participants did not record any data.

RESULTS

Initially, 57 subjects were enrolled in the study (**Figure 1**). Thirty-five subjects met the exclusion criteria and thus only 28 subjects could potentially participate in the intervention. Of these 28 subjects, 5 persons dropped out due to health or occupational concerns. Consequently, 23 subjects remained and completed the study. The general characteristics of subjects who participated in the study are summarized in **Table 2. Table 3** illustrates pre- and post-intervention outcomes among the study participants. By the end of the 11th week, a statistically significant weight reduction of 6.7% from baseline weight was observed (P<0.001). Total calorie intake showed a significant reduction of 32.6% from the baseline energy intake (P<0.001). Furthermore, there was a significant increase in moderate-intensity physical activity compared to baseline (P<0.05). In addition, while there was a slight increase in consumption of vegetable and fruit portions from the baseline, the difference was not statistically significant. Similarly, although there was an apparent reduction of 30.4% in saturated fat intake compared to the baseline, the difference was not statistically significant. Remarkably, overall dietary diversity as measured by the FGDS significantly increased (P<0.001), surpassing the FGDS's normal cut-off value of 5 points. With the exception of two food groups—namely, grains, white roots and tubers, and plantains as well as meat, poultry, and fish—participants consumed a greater variety of foods across all other food groups. Weekly percentage weight loss relative to the baseline is shown in **Figure 2**. The effect of time on weight loss was assessed using repeated-measures ANOVA with Bonferroni correction. Results revealed significant weight reduction between successive weeks (P <0.001) and occurring between week 1 and week 2 (0.95 kg [95% CI, 0.3 to 1.5], P <0.05), week 2 and week 3 (0.45 kg [95% CI, 0.37 to 0.86], P <0.05), week 4 and week 5 (0.55 kg [95% CI, 0.01 to 1.08], P <0.05), week 5 and week 6 (0.57 kg [95% CI, 0.11 to 1.03], P <0.05), week 6 and week 7 (0.45 kg [95% CI, 0.04 to 0.87], P <0.05), and week 8 and 9 (0.47 kg [95% CI, 0.14 to 0.81], P <0.05), respectively. **Table 4** provides an overview of the extent to which program goals were achieved. Among the 23 subjects who completed the program, 43.5% achieved a 7% body weight loss. Furthermore, 43.5% successfully reduced their total fat intake to less than 25% of their total daily energy intake, while 78.3% met the goal of reducing saturated fat intake to less than 10% of their total daily energy intake. Additionally, 87.0% of the participants accomplished the exercise goal of 150 minutes per week of moderate-intensity aerobic exercise.

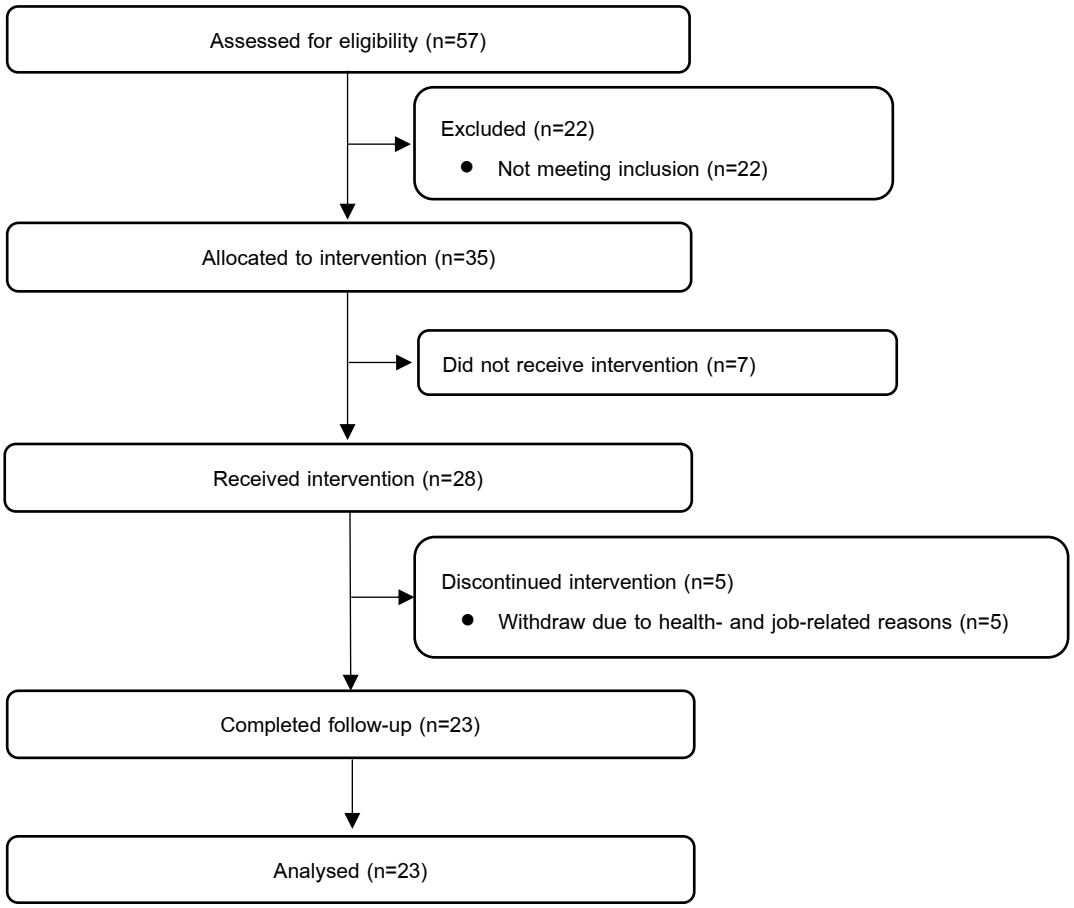

Figure 1. Consort flow diagram for the study

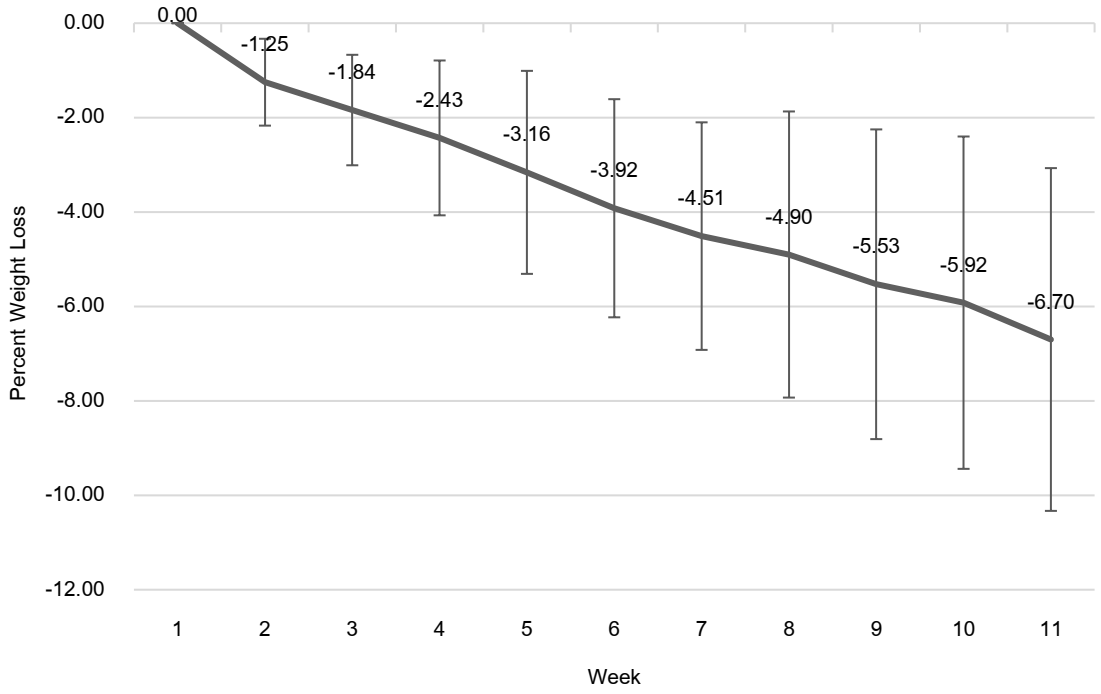

Figure 2. Percent weight loss compared to baseline per week

Table 2. General characteristics of the study participants

Characteristics	Values (*n* 23)	
	Mean	SD
Age (years)	30	6
Male (%)	34.8	
Female (%)	65.2	
Educational level		
- Secondary school and high school, %	4.3	
- Tertiary school (diploma, Bachelor, Master, Doctor), %	95.7	
Employment status*		
- Employed, %	56.5	
- Unemployed, %	43.5	
Body weight, kg	76.14	8.01
Height, cm	161.57	8.56
Body mass index, kg/m^2	29.46	4.76
Obesity classification†		
- Overweight, %	65.2	
- Class I obesity, %	30.4	
- Class II obesity, %	4.3	
Stage of change‡		
- Pre-contemplation, %	4.3	
- Contemplation, %	26.1	
- Preparation, %	30.4	
- Action, %	39.1	

*Unemployed participants included students and housewives, while employed participants included government staff, business owners, and corporate workers.

†Obesity classification is based on the World Health Organisation's criteria.

‡Stage of change according to the transtheoretical model.

Table 3. Pre- and post-intervention outcomes of study participants

Outcomes	Pre-intervention (*n* 23)		Post-intervention (*n* 23)		% Change	*P*-value**
	Mean	SD	Mean	SD		
Weight, kg	75.98	11.06	70.90	9.90	-6.7	<0.001
Body mass index, kg/m^2	29.02	2.95	27.14	3.06	-6.5	<0.001
Vegetable and fruits, portions	2.14	1.39	2.39	1.25	11.7	0.420
Energy intake, kJ/day	5803.20	1924.64	3916.22	836.80	-32.6	<0.001
Carbohydrate, g	189.99	56.51	127.06	39.09	-33.1	<0.001
Protein, g	58.08	28.19	42.13	10.34	-27.3	<0.05
Fat, g	41.52	22.70	28.82	9.58	-30.5	<0.05
Total fat, % of total energy	25.67	6.86	27.66	7.30	7.7	0.367
Saturated fat, g	11.76	7.30	8.18	3.27	-30.4	0.053
Physical activity, min/week	147.17	134.79	331.90	341.32	125.6	<0.05
FGDS*, points	3.62	0.98	5.18	0.97	43.1	<0.001
Grains	2.78	0.85	1.96	0.56	-29.4	<0.05
Pulses	0.35	0.48	0.83	0.71	134.2	<0.05
Nuts and seeds	0.04	0.21	0.09	0.28	100.0	0.564
Dairy	0.30	0.47	0.74	0.44	143.0	<0.05
Meat, poultry, and fish	2.70	1.18	2.48	0.66	-7.0	0.308
Eggs	0.74	0.54	0.87	0.34	17.5	0.18
Dark green leafy vegetables	0.65	0.57	1.17	0.77	80.0	<0.05
Other vitamin A-rich fruits and vegetables	0.09	0.28	0.48	0.51	433.0	<0.05
Other vegetables	1.78	1.44	3.26	1.71	82.5	<0.05
Other fruits	0.96	1.18	1.78	0.90	85.4	<0.05

*FGDS, food group diversity score.

**The pairwise differences between pre-and post-intervention were compared using a paired sample *t*-test, except for saturated fat and grains for FGDS, which were compared using the non-parametric Wilcoxon signed rank test.

Table 4. Program goals of study participants

Program goals	Values (*n* 23)
Participants who achieved 7% weight loss at the end of intervention (%)	43.5
Participants who achieved total fat intake less than 25% of daily energy intake at the end of intervention (%)	43.5
Participants who achieved saturated fat intake less than 10% of daily energy intake at the end of intervention (%)	78.3
Participants who achieved physical activity goals at the end of intervention (%)	87.0

DISCUSSION

This study's findings indicate that the Group Lifestyle Balance (GLB) program delivered through an online videoconferencing platform can be effective in achieving significant weight loss and promoting healthy lifestyle changes within a relatively short duration. The weight loss achieved in this study was both statistically and clinically significant. Participants also demonstrated an increase in their overall physical activity levels. Although improvements in vegetable, fruit, and saturated fat intake were not statistically significant, the significant increase in the Food Group Diversity Score suggests that participants made more diverse food choices by the end of the intervention, which indicates a positive shift toward a healthier dietary pattern. The magnitude of weight loss and the increase in physical activity levels observed in this study align with previous studies that applied the original Diabetes Prevention Program (DPP) protocol or the GLB program protocol. These studies consistently reported weight losses ranging from 2% to 7% from baseline after a 12-week teaching period[11,21,22]. The effectiveness of the remote delivery of the GLB program in achieving these outcomes can be attributed to several factors. One important advantage is the ability of educators to remotely supervise and monitor participants' progress. Through real-time communication, educators can provide ongoing support, address any questions or challenges, and offer guidance as needed. This personalized interaction and support contribute to the participants' success in achieving weight loss and adopting healthier lifestyle habits. Furthermore, the remote delivery of the program via telenutrition offers convenience and accessibility for participants. They can engage in the program from the comfort of their own homes, eliminating the need for travel and potential barriers associated with attending in-person sessions. This convenience may attract individuals who are motivated to lose weight and improve their lifestyle but do not have any significant health issues requiring close monitoring. Additionally, the distribution of participants across different stages of behaviour change, with the majority in the "action" stage, suggested that the telenutrition program was effective in engaging individuals who were already motivated and ready to make positive changes in their lifestyle. This readiness for change likely contributed to the excellent weight loss observed in the study[23]. The results

of the repeated measures ANOVA further support the effectiveness of the program. Significant weight loss was observed between successive weeks, except between weeks 3 and 4. This finding suggested that the program was successful in facilitating continuous weight loss over the 12-week period, with participants consistently making progress towards their weight loss goals. The structure of the weekly sessions, with essential knowledge about nutrition and physical activity taught in the earlier weeks and strategies for problem-solving, stress management, and motivation taught in the later weeks, appears to be effective. By providing participants with the necessary information and skills early on, the program likely set a solid foundation for sustained weight loss throughout the intervention. The gradual progression of topics and strategies may have also helped participants build confidence and develop coping mechanisms, leading to better adherence to the program. Maintaining the order of weekly sessions as outlined in the study is recommended to ensure the optimal sequencing of content delivery. Starting with foundational knowledge and gradually introducing more advanced strategies and skills can enhance participant engagement and success in achieving weight loss goals. The excellent adherence demonstrated by the study's participants likely contributed to the positive outcomes observed. The fact that all participants in the study attended all twelve sessions and consistently submitted their monitoring records weekly indicates a high level of engagement and commitment. This adherence could be due to the convenient schedule and ease of attendance both of which are owing to the streamlined communication of telenutrition. The finding from the cohort study at the Comprehensive Weight Control Centre at Weill Cornell Medicine and the Centre for Weight Management at Scripps Health further supports the positive impact of telemedicine platforms on adherence. The study reported a significant reduction of 27.2% in the no-show rate of patients and an increase in completed visits when weight management counselling was transitioned to a telemedicine platform[24]. This suggests that the convenience and flexibility offered by telemedicine can enhance patient engagement and participation. The cost-effectiveness of the telenutrition program in this study is another important factor that likely contributed to good adherence and favourable outcomes. While a formal cost evaluation was not conducted, the approximate cost per participant over the 12-week period was estimated to be US$35. This cost included the data package for weekly telenutrition sessions, the weighing scale, and the printing of 24-hour food record forms. The use of participants' existing smartphones for video conferencing also contributed to cost savings since the cost of electronic devices was not included in the program's estimate. This highlights the advantage of utilizing commonly available technology to deliver interventions, making them more accessible and cost-effective. Compared to traditional brick-and-mortar behavioural change programs, the telenutrition program offered potential cost savings. Participants were able to attend the sessions remotely, eliminating the need for transportation and accommodation expenses that may be incurred when attending in-person sessions. Additionally, the cost of training educators and printing educational materials may have been

reduced in the telenutrition program. The cost-effectiveness of telehealth services, including telenutrition, has been demonstrated in various reviews[25,26]. These reviews have shown that telehealth services can provide cost savings from both the provider and receiver perspectives. The elimination of certain expenses associated with in-person interventions, combined with the convenience and accessibility offered by telehealth, contribute to the cost-effectiveness of these services. The study was carried out among the Myanmar people and cultural consideration was noted. The original teaching material was accustomed to the Western dietary pattern. Consequently, certain examples based on local popular foods were used to assist participants in comprehending messages. For instance, rice and noodles were used as an example for carbohydrate foods instead of pasta and bread. Local fruits and vegetables were used when teaching healthy diet proportions. Apart from the differences in food items used as examples, general principles and methods were provided as per the learning material. The material was flexible and only required minor modifications to address culturally different aspects, which has been proven by its delivery to different ethnic populations[11,12,20,21]. This study indeed has several limitations that should be considered when interpreting the results. The absence of a control group limits the ability to establish a causal relationship between the telenutrition program and the observed outcomes. A control group would have provided a comparison to assess whether the observed weight loss and lifestyle improvements were specifically attributable to the program or could have occurred naturally over time. The relatively small sample size also limits the generalizability of the findings. Due to the small sample size, some values were widespread. This is evident in the value of physical activity level and the FGDS score of two food groups, “other vitamin A-rich fruits and vegetables” and “other fruits”. For physical activity, we did not set an upper limit and just encouraged participants to do at least 150 minutes of moderate intensity physical activity per week. Depending on an individual’s enthusiasm, some participants conducted physical activities just above the encouraged minimum limit, while some others did physical activities significantly higher than the minimum recommended level. Regarding food groups, fruits and vegetables are classified into four different categories in FGDS calculation: dark leafy green vegetables, other vegetables, other vitamin-A rich fruits and vegetables, and other fruits. Although participants consumed fruits and vegetables every week, the participants mainly consumed items in the group of “other vegetables” at pre-intervention and post-intervention. This is probably due to the availability of the vegetable items and the cost, as the vegetables were relatively cheaper than the fruits. The participants only increased fruit consumption at post-intervention, and the fruits were mainly from the group “other fruits”. Consequently, values in some groups such as “other fruits” at pre-intervention and “other vitamin-A rich fruits and vegetables” were widespread. The study was conducted among participants with good educational levels, which may not represent the broader population. Including participants from diverse socioeconomic backgrounds would provide a more comprehensive understanding of the program's effectiveness across different

demographic groups. The 12-week follow-up period was also relatively short, and longer-term follow-up is necessary to evaluate the sustainability of the weight loss and lifestyle changes achieved. Monitoring weight maintenance and evaluating other health parameters over an extended period would provide a more complete picture of the program's long-term impact. The inability to collect blood samples and conduct in-person examinations is also a limitation, as it restricts the assessment of important health parameters such as blood glucose profile, lipid profile, blood pressure, and abdominal obesity. These measures could provide valuable insights into the participants' overall health statuses and the potential effects of the program on these parameters. Self-reported food records and physical activity data are also subject to bias and inaccuracies, which is a common limitation in weight loss studies[27]. Participants may have unintentionally misreported their food consumption and physical activity levels, which could introduce measurement errors. Utilizing objective measures or employing more robust monitoring techniques, such as providing uniform wearable devices or dietary biomarkers, could enhance the accuracy of data collection in future studies. However, recording food intake data for 3 days (1 weekend and 2 non-consecutive weekdays) and taking a weighted average would make the data more reliable. In addition, the recording methods were taught with video using common home appliances so that the participants could readily understand and measure amounts correctly. Physical activity data were measured daily and taken as the average so that the data was less variable.

CONCLUSION

This study demonstrated that the application of a telenutrition platform to deliver the GLB program can be beneficial in assisting overweight and obese Myanmar adults to achieve significant weight loss within a relatively short period. Despite certain limitations, this study can serve as scientific proof of feasibility for a large-scale nationwide program for lifestyle modification and body weight modification for Myanmar people.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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