



A Comparative Analysis of Weight Management and Dietary Pattern among Mobile Health Application Users and Non-Users of Gym Going Population

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Abstract: Obesity is one of the major nutritional problem prevalent among the global population and is starting to supplant malnutrition and infectious diseases as the main cause of poor health. The majority of the gym going population were found to be obese and overweight. Improper dietary patterns and lack of nutritional knowledge can lead to unhealthy weight loss and have a major negative impact on health. Recent trends of nutritional interventions in mHealth (mobile health) and eHealth (electronic health) are involved in new development of mobile applications to provide nutritional information and facilitate healthy weight management practices. Although the emergence of new health applications is increasing, their effectiveness in weight management have to be administered. This study aimed to compare the weight management and dietary patterns of mobile health application users and non-users among gym-going population. This study was conducted among 100 gym going population, with 50 app users and 50 non-users. Anthropometric measurements such as height, weight, waist hip ratio were taken and dietary intake pattern were assessed through 24-hour dietary recall and food frequency questionnaire. Frequency table, percentage analysis and independent t-test were used for statistical analysis. Independent t-test was used to determine the significant difference of means in each parameter between the groups. Differences were considered significant at $p < 0.05$ level and $p < 0.01$. The findings revealed no significant differences in weight management and dietary practices between app users and non-users. However, the healthier dietary practices associated with successful weight loss were observed mostly among the app users compared to the non-users.

Key words: Obese, Overweight, mHealth, eHealth, Weight management, Nutrition intervention, Gym going population.

1. INTRODUCTION

Unhealthy eating habits and obesity have grown to be serious global public health issues. By 2035, 51% of people worldwide are predicted to be overweight or obese, according to the International Obesity Federation's World Obesity Atlas 2023 study. In particular, it is connected to non-communicable diseases such diabetes mellitus, heart disease, some types of cancer, and respiratory problems. Obesity has become a global epidemic due to a mix of genetic susceptibility, increased accessibility to high-carb diets, modern lifestyles, and a decreased need for physical activity. Gender disparities and energy balance are also important factors in determining obesity (Alamuddin, N., *et al.*, 2016).

The creation of mobile applications to offer nutritional data and support good weight management practices has been a recent trend in nutritional intervention in mHealth and eHealth. Users of diet apps typically have to manually enter the foods they eat each day, convert them into their nutrient consumption, and then summarize the results using graphs and visuals. Additionally, it evaluates these results in relation to nutrition goals, offers insightful data and comments on dietary practices, and enables users to enhance their eating and exercise routines (Aljuraiban G. S, 2019). Numerous health applications offer gym access, online fitness courses, and group exercise. The development of these programs is considerably aided by the knowledge of qualified yoga instructors, personal trainers, and nutritionists, giving users a full experience.

Since many members of the gym-going community are overweight or obese, this group is a target for weight management therapies. The health app incorporates a number of behavior-change techniques (BCTs) that have been shown to be effective in nutrition and physical activity interventions, including self-monitoring, intention formation, specific goal setting, review of behavioral goals, and performance feedback (Behl S & Misra A, 2017). Although there is a growing number of new health applications available, there is yet no conclusive

proof that using these apps will help obese and overweight gym-goers eat healthier and be more active.

This study aims to address these research gaps by evaluating the effectiveness of mobile health interventions on weight management and dietary patterns between mobile health application users and non-users, and to provide insights into the potential benefits and limitations of these applications in supporting healthy lifestyle behaviours.

2. METHODOLOGY

A structured questionnaire was used to collect data on various aspects, including demographic information and anthropometric measurements [Height, Weight, Body Mass Index (BMI), and Waist-Hip Ratio (WHR)]. The questionnaire included data on app usage, physical activity, weight management, dietary habits, and sleeping patterns. Food frequency questionnaire and 24-hour dietary recall were used to assess the dietary patterns of the participants.

The study was conducted at three fitness centres in Chennai, Tamil Nadu. The participants were selected through stratified random sampling, the sample size calculation initially suggested 196 participants, but after considering the exclusion criteria such as unwillingness to participate and existing disease or comorbidities, the final sample size was adjusted to 100 with 50 app users and 50 non-users, aged between 17 and 50 years.

The data collected was analysed using SPSS software which features frequency tables, percentage analysis, and independent t-test to identify the statistical differences between the two groups.

3. RESULTS AND DISCUSSION

Anthropometric measurements

Table 1: Anthropometric measurements among two groups

Anthropometric measurements	App users (Mean)	App Non-Users (Mean)
Height (cm)	168.50	169.74
Weight (kg)	79.3	78.2
BMI (kg/m ²)	27.7	27.3
Waist/Hip (WHR)	0.92	0.91

Table 1 represents the summary of anthropometric measurements of the participants. The average height was 168.5 cm among app users and 169.7 cm among non-users. The mean weight was found to be 79.3 kg and 78.2 kg for app users and non-users respectively. The participants had an average BMI of 27.7 kg/m² and 27.3 kg/m² hence classified as obese class I according to WHO guidelines for Asians. The mean WHR was 0.9 for both the groups indicating abdominal obesity based on the modified WHO criteria for Asians. The results showed no significant differences in these anthropometric parameters between the two groups ($p > 0.05$).

Weight management

Table 2: Comparison of weight management outcomes between the two groups

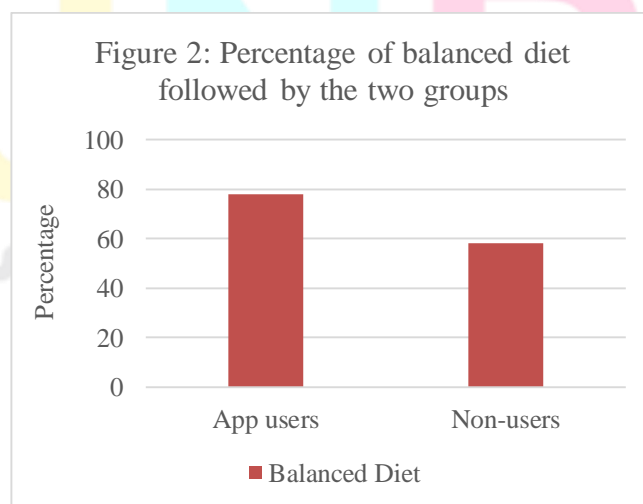
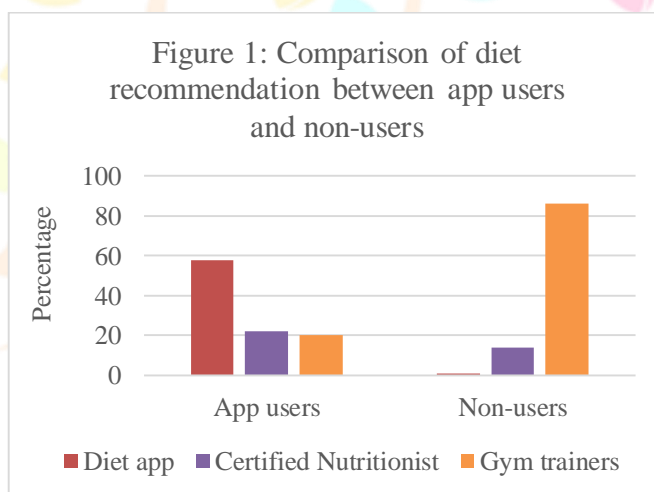
Weight loss	App users n (%)	App Non-Users n (%)
1-5 kg	17(34)	22(44)
6-10 kg	7(14)	4(8)
12-20 kg	3(6)	3(6)
25-30 kg	1(2)	0(0)
0 kg	3(6)	3(6)

Table 2 illustrates the comparison of weight management outcomes between the two groups in a duration of 1-3 months. The standard weight loss recommendation according to the National Institute for Health and Care Excellence (NICE), 2023 and the National Heart Lung and Blood Institute (NHLBI) for obese class I is 0.5–1 kg per week, translating to a weight reduction of approximately 6–12 kg over 3 months. A greater percentage of app users (14%) achieved weight loss within this recommended range (6–10 kg) compared to non-users (8%). However, non-users had a higher percentage (44%) achieving modest weight loss (1–5 kg), which is at the lower end of the guideline range. Both the groups showed comparable outcomes, with no significant differences in weight loss patterns.

Dietary Pattern

Table 3: Comparison of dietary pattern between the two groups

Variables	Category	App users		App Non-Users	
		n	%	n	%
Diet recommendation	Diet app	29	58.0	-	-
	Trainer	10	20.0	43	86.0
	Nutritionist	11	22.0	7	14.0
Type of diet followed	Balanced diet	39	78.0	29	58.0
	Low carbohydrate diet	4	8.0	3	6.0
	Paleo diet	-	-	-	-
	Keto diet	-	-	2	4.0
	Nil	7	14.0	16	32.0
Type of cereal consumed	High fibre (All bran, wheat, oats)	29	58.0	19	38.0
	Others (Corn flakes, Rice krispies)	4	8.0	2	4.0
	Refined cereals (Rice, dosa, idly)	17	34.0	29	58.0



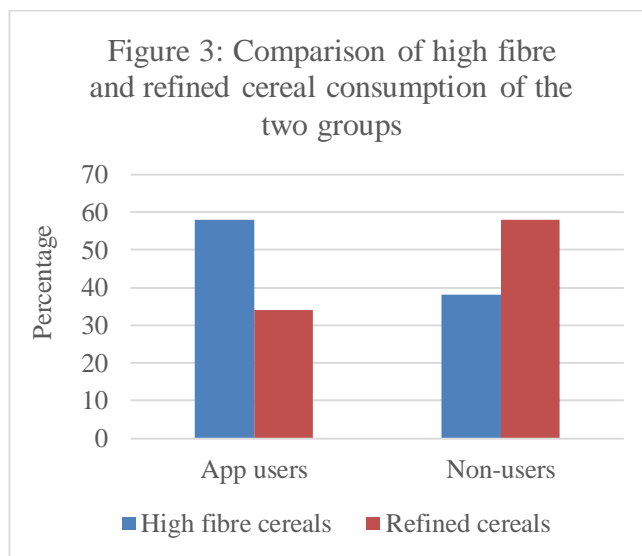


Table 3 and figure 1, 2 and 3 reveal the analysis of the dietary pattern comparison between the two groups.

Meal planning, calorie distribution and diet recommendations provided by certified nutritionist either directly or through diet apps were significantly higher among app users (58% relying on apps and 22% consulting nutritionist). In contrast, a majority of non-users (86%) depended primarily on gym trainers for dietary advice compared to app users (20%).

Regarding cereal consumption, high-fibre foods such as wheat and oats were mostly consumed by app users (58%) compared to non-users (38%). App non-users showed a greater inclination towards refined cereals such as rice and dosa (58%) which is only 34% in app users. According to a study conducted by Kelly, *et.al* (2023), increased consumption of fibre-rich foods was associated with improvement in perceived health and energy levels, increased confidence of losing weight and choosing healthy foods, alongside achieving significant weight loss outcomes which is consistent with the findings of this study.

Balanced diet was predominant in both groups but were significantly higher among app users (78%) compared to non-users (58%). Low-carbohydrate and keto diets were adopted by a small fraction of both groups, with a negligible representation of other diet trends such as the Paleo diet. A study by Contreras, *et.al* (2024) reported that a balanced diet tailored to individual energy needs and lifestyle is more effective for sustainable weight management than restrictive or single-nutrient-focused diets. Hence the present study was in accordance with the previous study.

These differences indicate that app users adhere to healthier dietary practices compared to non-users and the use of mHealth may potentially contribute to better weight management and long-term health outcomes in individuals with obesity.

Table 4: Comparison of macronutrient intake of app users and non-users

Macronutrient intake	Groups	Mean	SD	p value
Energy (kcal)	App Users	1175.0	328.71	0.738
	Non-Users	1152.83	333.52	
Protein (g)	App Users	47.54	20.99	0.424
	Non-Users	44.33	18.84	
Carbohydrate (g)	App Users	167.40	59.75	0.615
	Non-Users	172.91	48.74	
Fat (g)	App Users	27.07	14.06	0.345
	Non-Users	24.63	11.57	

Table 4 depicts the comparison of macronutrient intake of the two groups which was derived from the 24 hours diet recall.

The mean energy intake of app users was 1175.0 kcal (328.71) and non-users was 1152.83 kcal (333.52). The p value of mean energy intake was found to be 0.738, hence it was not statistically significant. For weight management in individuals with Obesity, The National Heart, Lung and Blood Institute (NHLBI) suggests using calorie restriction as part of a structured weight-loss plan, comprising a deficit of approximately 500–750 kcal per day which translates to 1200 to 1500 kcal for women and 1500 to 1800 kcal for men. Both groups fall within the lower end of the RDA range which can be appropriate for a calorie-deficit weight loss.

The mean protein intake for app users was 47.54 g (20.99), compared to 44.33 g (18.84) for non-users, with a p-value of 0.424, showing no statistically significant difference. The general ICMR guideline suggests 0.83g/kg body weight/day. However, for weight management in obese individuals, according to World Health Organisation (WHO) 15% of total energy is recommended. This contributes to 56.2 to 67.5g/day for men and 45 to 56.2g/day for women. The protein intake of app users is sufficient for women consuming 1200 kcal/day but falls short for higher calorie needs and for all men. Non-users are below the recommended range for both men and women, indicating greater protein deficiency. This deficiency could lead to muscle loss, reduced metabolic rate, and decreased satiety during weight loss.

The mean carbohydrate intake of app users was 167.40g (59.75) and non-users was 172.91g (48.74). The p value of carbohydrate intake was found to be 0.615, hence it was not statistically significant. According to WHO guidelines, carbohydrate should contribute 55 to 65% of total energy. This accounts for 206.2 to 234.3g/day for men (1500 kcals) and 165 to 195g/day for women (1200 kcals). App users met the lower end of the carbohydrate recommendation for women but falls short for men, especially for those needing higher calorie intake. Non-users is within the recommended range for women but still inadequate for men.

The mean fat intake of users was 27.07g (14.06) and non-users was 24.63g (11.57). The p value of fat intake was found to be 0.345, hence it was not statistically significant. According to WHO, less than 30% of total energy intake is recommended which comes around 50 to 60g/day for men and 40 to 50g/day for women. Both the groups fall below the recommended range which shows insufficient intake of essential fatty acids and fat-soluble vitamins.

4. CONCLUSION

The majority of gym going population were found to be overweight and obese. Their strong emphasis on weight loss and weight management affects their eating patterns and nutrient intake, which is detrimental to the nutritional balance. By offering pertinent nutrition information and behavior modifications, the new fitness and nutrition technologies promise to address these issues. To ascertain its effectiveness, there is a research gap.

In order to determine how well application-based mobile health interventions support weight management, the current study aimed to compare the food consumption of app users and non-users and evaluate their weight control practices. Both app users and non-users consume insufficient amounts of energy, protein, carbs, and fat, indicating that there are no appreciable differences in the macronutrient intake of the two groups. Nonetheless, app users were more likely to follow healthy eating practices, such as eating a balanced diet, including foods high in fiber, drinking enough water, taking dietary supplements, scheduling meals appropriately, and maintaining a regular sleep schedule.

Healthy weight reduction was noted in both groups, and the weight loss progress was determined to be comparable in both. Thus, the study's findings indicate that there are no appreciable variations between mobile health app users and non-users in terms of diet and weight control. However, app users were more likely than non-users to adopt the healthy eating practices linked to successful weight loss.

There were notable limitations to the study. Self-reported survey data were used for the questionnaire and corresponding analysis. In addition, the effectiveness of mHealth application prior and after use can also be employed.

Statement of informed consent

Informed consent was obtained from all participants included in the study.

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