

Questionnaire to assess adherence to diet and exercise advices for weight management in lifestyle-related diseases

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ABSTRACT

Background: Lifestyle-related diseases have assumed significant public health problem across the globe including developing nations. High rate of nonadherence to treatment poses challenges to family physicians in its treatment. **Objective:** To develop a valid and reliable questionnaire for assessment of adherence to lifestyle modification advices. **Materials and Methods:** The questionnaire was developed following a systematic, scientifically accepted methodology which included literature review, focused group discussions, detailed interviews, and expert evaluation. Comprehensibility, replicability, face validity, content validity, patient acceptance, and ease of usage of the questionnaire were analyzed. Five-point Likert scale was employed as response options. Cronbach's alpha was calculated to assess internal consistency of overall questionnaire. A cross-sectional survey was then performed on 100 obese patients with nonalcoholic fatty liver disease to validate the questionnaire. **Results:** The developed questionnaire consists of 14 questions under two domains, 12 items under diet and 2 items under the physical activity domain. Each of these questions is on a 5-point Likert scale. The tool has shown satisfactory validity. It also has adequate reliability and internal consistency with Cronbach's alpha value of 0.9. **Conclusion:** It is a valid and reliable tool which can be used in clinical practice to assess adherence to lifestyle modification advices by family physicians.

Keywords: Adherence, diet, exercise, lifestyle, questionnaire

Introduction

With rapid economic development and increasing westernization of lifestyle in past few decades, prevalence of obesity and other lifestyle-related diseases has increased at an alarming rate across globe including India.^[1] Obesity is an important risk factor in many lifestyle-related diseases like diabetes, hypertension, coronary artery diseases, stroke, etc.^[2,3]

Lifestyle modification advices like calorie restricted balanced diets and regular physical exercises are the cornerstones in the management of all lifestyle-related diseases. A weight loss of 5–10% of existing body weight results significant reduction in the metabolic risks among these patients and is recommended as standard treatment protocol.^[4] Studies suggest that only 15% of subjects achieve the goal of 10% body weight reduction mostly because of the lack of compliance and nonadherence to lifestyle modification advices.^[5]

Most of these cases seek help from family physicians. They have a major role to play not only in giving curative advices but also in

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planning preventive strategies. Understanding the determinants of nonadherence to lifestyle modification advices can help family physicians to plan and execute focused interventions to assist these patients in achieving long-term and sustainable weight loss. Absence of standardized tools makes it difficult to assess the quantum of adherence in patients with lifestyle diseases. Thus, we planned this study to develop and validate questionnaire that would be extremely useful for family physicians in treating this common and important condition.

Materials and Methods

The questionnaire was developed in a systematic manner, using scientifically accepted methodology which included literature review, focused group discussions (FGDs), expert evaluation, pretesting, and validation.^[6] The study was approved by ethical committee of our institute, and all the participants gave informed written consent prior to their participation.

Development of questionnaire

Questionnaire was developed in a systematic multistep method.

Development phase

Step 1: Review of literature

In depth literature review was done to look for preexisting information in the field of lifestyle disease-related questionnaires and define the construct of the questionnaire. Keywords such as “adherence,” “questionnaires and surveys,” “noncompliance,” “nonalcoholic fatty liver disease,” “lifestyle diseases,” “lifestyle modification advices,” and “behavior modification” were used in PubMed, Google scholar, Web Of Science, Medline, and other medical search engines to look for relevant studies done over the past 5 years.

Step 2: Focus group discussion and detailed interviews

FGDs and detailed interviews were conducted with obese patients with non alcoholic fatty liver disease (NAFLD) enrolled from medicine OPD and metabolic clinic to understand their perspective about lifestyle modifications as a treatment for obesity and NAFLD. Active participation and interaction of the subjects was encouraged during two sessions with six obese NAFLD patients in each discussion. Sessions were continued until no new ideas were available from the groups. More focused questions were asked. The data were recorded, analyzed qualitatively, and new items were included in the construct.

Step 3: Item generation

A list of items was generated that adequately represented the construct of the questionnaire in a simple and lucid language. Attention was given to proper sequencing and framing of questions. Items were checked again and again, to ensure that questions are relevant.

Step 4: Expert evaluation

Questions were then reviewed and improved by experts in internal medicine, metabolic disease, dietetics, physical and medical rehabilitation, statistics and gastroenterology, and human nutrition, to avoid any ambiguity and confusion. Questions which were leading, ambiguous or duplicate, in nature were removed at this stage.

Step 5: Pretesting

The final draft of questionnaire duly endorsed by experts was pretested in 20 obese NAFLD patients. Analysis for comprehensibility, replicability, patient acceptance, and ease of usage was done during the pretesting phase. Questions that were irrelevant, ambiguous, and duplicate were eliminated. After required updation, the questionnaire was used for face to face interviews. 5-point Likert scale was employed as response options assuming equal distance between response objects. Questionnaire was administered by the investigator because of little formal education of the study population.

Validation phase

The developed questionnaire was subjected to validity testing through a cross-sectional survey on 100 obese NAFLD patients between the age of 18–60 years, who attended Gastroenterology and Medicine OPD at our institute. After obtaining patient’s consent, the questionnaire was administered by the chief investigator in the language understood by the participants, either in Hindi or English. Patients were excluded if they had other causes of fatty liver, refused to give consent and or were unable to communicate. The validity and reliability of the questionnaire was psychometrically tested using the collected data from patients.

Item scoring

Score was assigned to each response based on association with healthy dietary habits and physical activity. Higher points were given to responses with healthy dietary habits and physical activity and lower points were given to responses with bad dietary habits and physical activity. For each question, minimum response was 1 and maximum response was 5. For each question, there was continuum of responses from 1 to 5. To determine the final score, each question score was summed up leading to data on Likert scale.

Statistical analysis

Descriptive statistics was used for patients for analyzing demographic and clinical parameters. For the quantitative parameters mean, median, standard deviation quartile range was calculated. For reducing the questionnaire, principal component analysis and correlation matrix was used. In the item analysis, items which met any of the following conditions were removed: (a) one of any two items with correlation coefficient greater than 0.7; (b) correlation coefficient with other items and total score was very low i.e., less than 0.05 compared to that of other items. Cronbach’s alpha was used to assess reliability and homogeneity of overall questionnaire. Cronbach’s alpha

0.7 or higher was considered to have good internal consistency and is acceptable. Construct validity was established by factor analysis with varimax rotation to test the hypothesized domain structure. Exploratory factor analysis was performed to examine subdomain substructure.

Results

Development phase

A pool of 20 items was generated after literature review and two sessions of FGDs with 12 NAFLD patients, covering both the aspects of diet and physical activity. Responses were built using 5-point Likert scale assuming equal distance between response objects. By the end of literature review and FGD's, construct was clear and survey items were written in a language understood by the participants, making sure it made reference to a single concept, expressed in first person and avoiding double negatives. The final draft of questionnaire was subjected to check for content validity by a group of experts in Internal medicine, metabolic disease, physical and medical rehabilitation, statistics and gastroenterology, and human nutrition. Important modifications that rose from this stage were phrasing the questions with simple words, making questions easily understandable for patients and elimination of the items which are duplicate and ambiguous. A total of five ambiguous items were deleted at this stage.

The final draft of questionnaire with 15 items was applied to 20 obese NAFLD patients who came to medicine OPD, to look for relevance; clarity; readability which would finally establish construct validity. All the participants were able to interpret the questions easily and no modification was done.

Description of final questionnaire

The questionnaire developed composed of 15 questions under two domains, diet and physical activity. A total of 12 questions were under diet domain and 3 questions were under physical activity. Each of these questions is on Likert type items, from 1 to 5. As a result, addition of scores of 15 items provides data on Likert scale, with a minimum score as 15 and maximum score as 75.

Validation phase

The draft of questionnaire with 15 items was applied to 100 obese NAFLD patients, who attended Medicine and Gastroenterology OPD in AIIMS.

Background of participants

Out of the 100 obese NAFLD patients, 56 were male participants. The mean age was 38.43 years (SD: 9); mean body weight, 75.14 kg (SD: 12.26); mean height, 163.34 cm (SD: 9.35); mean BMI, 28.29 kg/m² (SD: 4.18). Baseline liver function test (LFT) was also done, mean serum glutamic oxaloacetic transaminase (SGOT) was 46.69 (SD: 14.99), mean serum glutamic pyruvic transaminase (SGPT) was 60.74 (SD: 20.28),

Table 1: Baseline characteristics of patients

Variables	Mean±Standard Deviation
Age (in years)	38.43±9.0
Weight (in kg)	75.14±12.26
BMI	28.29±4.18
SGOT (IU/L)	46.69±14.99
SGPT (IU/L)	60.74±20.28
Bilirubin (mg/dl)	0.6±0.2

mean bilirubin was 0.6 (SD: 0.2). These baseline characteristics are depicted in Table 1.

Item reduction

Correlation matrix of variables was done to look for correlation between the questions and reducing the number of the questions. With regards to correlation between items, 1 pair of items exhibited correlation coefficient of 0.7 or higher. Those were question numbers 14 and 15 (correlation matrix is available as Supplementary Table 1). One of the questions among both was removed because correlation between both of them was greater than 0.7, after discussing with experts regarding the same. The final draft of questionnaire after seeing correlation is composed of 14 questions under two domains, diet and physical activity. And 12 questions were under diet domain and 2 questions were under physical activity. Final draft of questionnaire is available as box 1. Following this, factor analysis was done.

Adherence to Lifestyle Modification Advices in Non-alcoholic Fatty Liver Disease Questionnaire

- Q1) How often do you eat meals in a day (including tea, coffee, fruits, salads, snacks)?
- >6 times
 - 6 times
 - 5 times
 - 4 times
 - 3 times.
- Q2) How often do you drink sweetened beverages like soft drinks, juices, etc.?
- At least once daily
 - 3 to 6 times a week
 - 1 to 2 times a week
 - 2 to 3 times a month
 - Once a month or less.
- Q3) How often do you eat sweets such as Laddu, Barfi, Jalebi, Kulfi, Chocolate, Halwa, Rice pudding, etc.?
- At least once daily
 - 3 to 6 times a week
 - 1 to 2 times a week
 - 2 to 3 times a month
 - Once a month or less.

- Q4) How often do you eat fried foods such as Puri, Parathas, Kachori, Tikki, Bhature, Pakoras, Samosas etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q5) How often do you eat high salt snacks such as Namkeen, Bhujia, Pickles, Chutney, Papad etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q6) How often do you consume sugar and honey in tea, coffee, curd, lassi, etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q7) How often do you eat fruit and salad?
- A) Every time in the main diet
 - B) At least once a day
 - C) 3 to 4 times a week
 - D) 1 time a week
 - E) Less than once a week.
- Q8) How often do you eat sprouted pulses and green vegetables?
- A) Every time in the main diet
 - B) At least once a day
 - C) 3 to 4 times a week
 - D) 1 time a week
 - E) Less than once a week.
- Q9) How often do you eat saturated fat like mutton fat, egg yolks, etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q10) How often do you eat refined food items like burgers, pizza, etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q11) How often do you eat ghee, butter, cream, mayonnaise, etc.?
- A) At least once daily
 - B) 3 to 6 times a week
 - C) 1 to 2 times a week
 - D) 2 to 3 times a month
 - E) Once a month or less.
- Q12) How often do you eat out of the house (such as wedding, party, family function etc.)?
- A) More than 3 times a week
 - B) More than once a week
 - C) 2 times in a month
 - D) 1 time in a month
 - E) Less than 1 time in a month.
- Q13) How many days do you exercise in a week?
- A) Daily
 - B) 5 to 6 times a week
 - C) 3 to 4 times a week
 - D) 1 to 2 times a week
 - E) Never.
- Q14) How much time do you exercise for each session?
- A) >40 minutes
 - B) 30–40 minutes
 - C) 20–30 minutes
 - D) 20–10 minutes
 - E) <10 minutes.

Factor analysis

The questionnaire was constructed keeping two domains in mind. Factor analysis was performed using the principal factor method and varimax rotations to examine the domain structure. Kaiser's criterion was used to enter the 14 items into the analysis and 6 components were extracted. A varimax rotation was performed to distribute the total variance explained by the 6 components more evenly. After exploratory factor analysis, we got around 6 domains which could explain approximately 69.07% of the variance as shown in Supplementary Table 2. We segregated 14 questions under 6 domains with each domain containing those questions with maximum loadings.

Reliability

The questionnaire showed good internal consistency in this sample with Cronbach's alpha of 0.94 indicating acceptable internal consistency.

Discussion

The looming epidemic of lifestyle-related diseases is mainly attributed to the improper dietary habits and physical inactivity.^[7] Adherence to healthy lifestyle advices not only reduces the risk but also plays an important role in the management of lifestyle-related diseases. Motivating patients to remain adherent to these advices is a huge challenge for family physicians and public health professionals.^[8] We developed and validated a questionnaire that will help family physicians to assess

patient's adherence to lifestyle modification devices especially those pertaining to diet and exercise. Besides, this will also help them to identify domains of nonadherence and thus help in individualizing the management and improve the adherence to lifestyle modification advices.

The developed questionnaire is a short and concise tool with 14 items. All domains which are crucial for achieving and maintaining healthy weight like quantity and quality of diet, meal type and frequency, intensity and duration of physical activity have been included in this questionnaire. Under the diet domain, questionnaire has items to check individual's intake of calorie dense unhealthy foods, such as fried foods, sugar sweetened beverages, fast foods containing saturated fats and refined flour, processed foods with excess salt content, etc. Besides, there are questions to assess the intake of healthy food items, such as fruits, salads, sprouts, etc. Questions pertaining to physical activity focusing on the frequency and duration of exercise per week have also been included.

In the last 1 decade, researchers from different parts of the world have shown interest in studying behavioral aspect of patients in the management of lifestyle-related diseases.^[9] Tools have been developed to assess knowledge, attitude, and practices of patients suffering from various lifestyle-related diseases.^[10,11] There are studies mainly from the western countries, which have emphasized on studying the adherence to diet and exercise advices in lifestyle-related diseases.^[12,13] Some of these questionnaires, individually focused on diet and physical activity, while some of them have addressed multidimensional components of lifestyle.^[14] A 25-item questionnaire called UK Diabetes and Diet (UKDDQ) was developed in 2016, for a quick assessment of dietary intake in diabetic patients.^[15] In Brazil, the fantastic lifestyle questionnaire has been translated and validated for use in 2008, which assesses the lifestyle of young adults.^[16] Similarly, another questionnaire called as the Lifestyle Appraisal Questionnaire was published in the year 2007, which was designed to assess multifactorial aspects of lifestyle including cumulative risks along with perceived stress of life.^[17] No such attempt has been made from the Indian subcontinent to develop a questionnaire which can assess the adherence to lifestyle modification advices. Since there is a marked sociocultural difference among people from different demographic regions, there is a need to modify and adapt the questionnaires made in the western countries, before their use in Indian population.

The questionnaire is first of its kind in the Indian setup that has used diet and exercise domains relevant to our country. It can be used in almost all lifestyle-related diseases, where adherence to diet and physical activity guidelines is important to maintain healthy weight. This questionnaire was built, modified, and validated by using standard methods. We found that questionnaire has good comprehensibility, face validity, content validity, and patient acceptance. One advantage of this tool is that it is less time-consuming and does not take more than 5 minutes to administer. It has simple phrases and is in easily understandable

language to the patients. As of now there are no such tools to assess adherence to lifestyle advices in lifestyle-related diseases, this tool can be instrumental in generation of data related to the burden and reasons of lack of compliance and/or nonadherence.

This questionnaire was developed by interviewing patients, majority of who belonged to North India. Thus, slight changes would be required for its use in different parts of the country, according to the regional dietary habits/food items preferences. Generalizability of the questionnaire could be increased by increasing the sample size. In our study, only 20 participants were used for cognitive debriefing. A large number of participants need to be assessed in order to draw a firm conclusion, but our questionnaire had good reliability and validity which would have detected any changes. Another point to emphasize is that whether a self-administered questionnaire would have provided a more objective way of administering a questionnaire. Such an instrument would definitely reduce response bias and interobserver variability.

Conclusion

Based on our analysis, we conclude that this questionnaire is a reliable and valid tool to assess adherence to lifestyle modification advice in lifestyle-related diseases, particularly in Northern Indian population. We think it can also be useful in any population when few modifications are made in the questionnaire, according to the regional dietary habits. This questionnaire makes way for future research where other important domains, such as stress, alcohol, smoking, etc., can be incorporated in this questionnaire, to cover all aspects of healthy life.

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Conflicts of interest

There are no conflicts of interest.

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Supplementary Tables

Supplementary Table 1: Correlation matrix

Correlation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Q1	1.000	0.194	0.213	0.069	0.182	0.211	0.216	0.162	0.115	0.172	0.117	0.200	-0.090	0.149	0.134
Q2	0.194	1.000	0.294	0.348	0.148	0.346	0.172	0.083	0.290	0.413	0.053	0.404	0.097	0.157	0.167
Q3	0.213	0.294	1.000	-0.075	0.153	0.172	0.119	-0.071	0.074	0.500	0.241	0.435	0.172	0.187	0.147
Q4	0.069	0.348	-0.075	1.000	0.157	-0.038	0.030	0.222	0.175	0.095	0.088	0.097	0.039	-0.045	0.029
Q5	0.182	0.148	0.153	0.157	1.000	0.240	0.211	-0.063	-0.056	0.402	0.253	0.347	0.034	0.174	0.202
Q6	0.211	0.346	0.172	-0.038	0.240	1.000	0.177	0.046	0.330	0.392	0.060	0.192	-0.088	0.035	0.075
Q7	0.216	0.172	0.119	0.030	0.211	0.177	1.000	0.101	0.180	0.338	-0.015	0.282	-0.275	0.094	0.056
Q8	0.162	0.083	-0.071	0.222	-0.063	0.046	0.101	1.000	0.154	-0.008	0.115	0.054	0.122	0.189	0.202
Q9	0.115	0.290	0.074	0.175	-0.056	0.330	0.180	0.154	1.000	0.411	0.094	0.121	-0.132	-0.059	-0.102
Q10	0.172	0.413	0.500	0.095	0.402	0.392	0.338	-0.008	0.411	1.000	0.251	0.562	0.010	0.166	0.174
Q11	0.117	0.053	0.241	0.088	0.253	0.060	-0.015	0.115	0.094	0.251	1.000	0.145	0.245	-0.162	-0.184
Q12	0.200	0.404	0.435	0.097	0.347	0.192	0.282	0.054	0.121	0.562	0.145	1.000	0.125	0.103	0.155
Q13	-0.090	0.097	0.172	0.039	0.034	-0.088	-0.275	0.122	-0.132	0.010	0.245	0.125	1.000	0.072	-0.008
Q14	0.149	0.157	0.187	-0.045	0.174	0.035	0.094	0.189	-0.059	0.166	-0.162	0.103	0.072	1.000	0.908
Q15	0.134	0.167	0.147	0.029	0.202	0.075	0.056	0.202	-0.102	0.174	-0.184	0.155	-0.008	0.908	1.000

Supplementary Table 2: Total variance explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.330	23.789	23.789	2.878	20.558	20.558
2	1.552	11.083	34.871	1.491	10.647	31.206
3	1.412	10.087	44.958	1.417	10.123	41.329
4	1.292	9.232	54.190	1.316	9.397	50.726
5	1.071	7.650	61.840	1.307	9.336	60.062
6	1.012	7.231	69.071	1.261	9.010	69.071
7	0.874	6.243	75.315			
8	0.808	5.774	81.089			
9	0.661	4.722	85.810			
10	0.524	3.744	89.554			
11	0.474	3.386	92.940			
12	0.417	2.978	95.918			
13	0.312	2.228	98.147			
14	0.259	1.853	100.000			