A short questionnaire to assess changes in lifestyle-related behaviour during COVID 19 pandemic

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ABSTRACT

Background and aims: The lasting impact of COVID 19 pandemic and associated restrictions are bound to be significant on lifestyle-related behaviour including diet, physical activity and sleep which is one of the important components in the management of diabetes mellitus and metabolic syndrome. This study was conducted to develop and validate a questionnaire to assess changes in individual's lifestyle-related behaviour during COVID 19 pandemic.
Materials and methods: The questionnaire was developed through a standardised methodology including literature review, focus group discussion, expert evaluation, pre-testing and validation. The face validity and content validity of the questionnaire were analysed. A cross-sectional survey was carried out on 103 participants to validate the questionnaire that used a 5-point Likert scale for the response option. Exploratory factor analysis was performed to establish construct validity. Cronbach's alpha was calculated to test the internal consistency of the whole questionnaire.
Results: A questionnaire with 20 items to assess the lifestyle-related behaviour of people was developed. The questionnaire shows a satisfactory validity and a good internal consistency with the Cronbach's alpha value of 0.72.
Conclusion: The developed tool is valid and reliable to assess the changes in lifestyle-related behaviour of individuals during COVID 19 pandemic.

1. Introduction

COVID pandemic has led to life-changing challenges among people across the globe. Terms like "social distancing" and "self-isolation" have become a reality. As people are trying to get accustomed with this, the confinement has drastically impacted citizens' lives bringing about a sudden and radical change in their daily routine and lifestyle [1].

Social isolation for extended periods can lead to boredom and stress which may further subject individuals to develop a greater tendency of overeating especially "comfort foods" which are usually high in calories [2,3]. Moreover, prolonged confinement at home may induce an increased screen time and reduced outdoor time thus, augmenting sedentarism [4]. Apart from this, being homebound and facing disruptions in daily routines may affect the sleeping patterns as well as the quality of sleep [5].

Lifestyle plays a crucial role in the development and management of type 2 diabetes mellitus (T2DM) [6]. This pandemic might take a long time to subside and its lasting impact on the individuals' lifestyle-related behaviour including diet, physical activity and sleep patterns is bound to be significant [7]. It is crucial for the physicians to study the impact of COVID-19 on lifestyle-related behaviour among the population who are at risk of developing T2DM and the patients who are under treatment of the same.

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Limited attempts have been made in this field by researchers across the world. Studies conducted so far have used semi-structured questionnaires that have not been validated for assessment. Moreover, there is a lack of a questionnaire that addresses all the major aspects of the lifestyle-related behaviour viz diet, physical activity and sleep patterns. Hence, the objective of this study was to design a questionnaire with a sufficient number of items that will be short, crisp, scientifically structured, validated, easy-to-use and applicable for people of south-east Asian countries to assess their lifestyle-related behaviour.

2. Materials and methods

A standardised methodology including steps such as literature review, focus group discussion, expert review, pre-testing and validation were undertaken to develop and validate the questionnaire [8,9]. Ethical approval was obtained from the Institutional Ethics Committee of the institute and informed consent was obtained from all participants.

2.1. Phase 1: development of the questionnaire

The development of this questionnaire was carried out systematically by following main steps: literature review, focus group discussions (FGDs), expert evaluation, and pre-testing summarized in Table 1.

Literature review: A comprehensive literature review using search engines like Google Scholar and Pubmed was done to have a wider view of the existing evidence on the impact of COVID on lifestyle-related behaviours (eating, activity and sleep) amongst people. Keywords such as "coronavirus", "COVID19" "questionnaire and surveys", "diet", "eating behaviour", "exercise and physical activity", "sleep", "lifestyle behaviour", "diabetes" were included in the search. This resulted in 238 related articles. Further screening the titles, abstracts and full-texts 27 articles were found to be relevant. Questions were identified from these relevant articles and 26 items were generated.

Focused Group Discussion (FGD): The FGDs were carried out with two groups - general public and experts from different fields of medicine, nutrition, exercise physiology, clinical psychology and metabolic experts to comprehend how they perceive the topic of interest. Three sessions, involving 6—8 participants, were conducted by the primary investigator, two with the general population and one with experts. These FGDs were carried out through online video calls which were recorded. Each FGD session was continued till saturation of themes and lasted for about 45—60 min. Open-ended questions were asked in a sequenced manner. The discussion was transcribed word by word and analysed qualitatively. This led to the addition of 15 items in the construct.

As a result of the extensive literature review and FGDs, 41 items were generated. The focus was laid on ensuring that the items were kept in appropriate sequence without any overlapping. The questions were constructed in simple English language to be easily understood by the participants, avoiding double negatives. A 5-point Likert scale was used as response options under each of the 41 items, assuming equal distance between response objects.

Expert evaluation for face and content validity of the questionnaire: The developed questionnaire was subjected to evaluation by the team of six experts from different medical fields for their inputs, critical appraisal and content validation. On this basis, no new items were inserted, 13 items were deleted and 4 were reworded.

Pretesting: The subsequent version of the questionnaire was pretested on eight participants of different age, gender and educational qualifications. In this step, we assessed participants' perception and acceptability of the tool. The participants were asked to fill in the questionnaire and comment upon the necessity, clarity and relevance of each item. Eight items were eliminated while 3 items were modified according to the panelists' recommendations. This led to the generation of 20 items under the final questionnaire.

2.2. Phase 2: validation of the questionnaire

In this phase, a survey was conducted to validate the questionnaire. The questionnaire was administered on 103 individuals aged 18 years and above, who were able to read and write and respond to an online web-based survey questionnaire. The investigator recruited participants in different demographic strata such as age, gender and socio-economic status in view of fulfilling maximum diversity. A google form was prepared and online data was collected in July 2020.

2.3. Statistical analysis

As reported earlier, content validity and face validity of the developed questionnaire were established through FGDs, expert evaluation and pretesting. For construct validity, we carried out exploratory factor analysis with varimax rotation to test the domain structure [10]. After performing construct validity, we used Cronbach's α coefficient to measure the reliability of our questionnaire. A coefficient of 0.7 or higher is preferred for a questionnaire to be internally consistent [11]. The data was analysed using IBM SPSS Statistics 24 software.

3. Results

The final version of the questionnaire comprising 20 items is enclosed in Appendix A. The scoring method for the questionnaire is enclosed in Appendix B. The questionnaire is freely available for use.

3.1. Socio-demographic profile of study participants

A total of 103 adults, with almost equal distribution of males and females, participated in the survey (Table 2). Their age ranged between 18 and 82 years (mean age: 35.92 ± 15.09 years). Around 90% resided in urban areas. Most participants were obese (47.8%),

Table 1
Steps involved in questionnaire development.

Step	Nature of activity	Methods	Number of items at the end of step	Addition or subtraction
I	Development of construct	Literature review	26	
II	Development of construct	FGDs	41	Addition of 15 items
III	Item generation	Develop items	41	—
IV	Establishment of face and content validity	Expert validation	28	Deletion of 13 items
V	Cognitive interviewing	Pilot study	20	Deletion of 8 items
VI	Establishment of Construct validity	Item analysis and Factor analysis	20	—

Table 2
Sociodemographic details of participants (n = 103).

Sociodemographic variable	Frequency (n = 103)	Percentage (%)
Age (years)		
<30	58	56.3
30–60	39	37.9
60 and above	6	5.8
Gender		
Male	53	51.5
Female	50	48.5
Type of residence		
Urban	87	84.5
Semi-urban	12	11.6
Rural	4	3.9
Educational status		
Profession or Honors	40	38.8
Graduate	41	39.8
Intermediate or diploma	10	9.7
High school	12	11.6
Marital status		
Married	55	53.4
Single	47	45.6
Divorced	1	0.8
Family status		
Nuclear	69	67.0
Extended	18	17.5
Joint	16	15.5
Socio-economic status		
Upper class	23	22.5
Upper middle class	58	56.9
Lower middle class	20	19.6
Upper lower class	1	1.0
Body Mass Index (kg/m^2)		
Underweight (<18.5)	6	5.8
Normal (18.5–22.9)	26	25.2
Overweight (23–24.9)	22	21.4
Obese (≥25)	49	47.8
Weight change during COVID-19		
Weight is stable	49	47.6
Lost weight	16	15.5
Gained some weight	33	32.0
Don't know	5	4.8

married (53.4%), living in a nuclear family (67.0%) and belonged to the upper-middle class (56.9%). The mean BMI of participants was 24.99 ± 4.88 kg/m^2 and the majority (47.6%) reported a stable weight.

3.2. Descriptive statistics of survey results

Our questionnaire was designed to assess if there were changes in lifestyle-related behaviour of people before COVID and during COVID pandemic. We found that approximately three-fourths of the participants reported either an increased or a similar intake of main meals, snacking between meals, portions of meals/snacks and a balanced diet including whole wheat, pulses, legumes, eggs, nuts, fruits and vegetables. On the other hand, the overall intake of fast food/junk food/fried food, sugar-sweetened beverages, sweets, chocolates has been found to be either similar or decreased, however, the intake of unhealthy foods out of boredom or stress has been found to be a bit increased by around 20% of the participants. Nearly 50% of the participants reported an increased intake of immunity-boosting foods during COVID period. They also reported increased family support for healthy eating and increased interest in learning healthy eating tips.

In the case of physical activity, we found that involvement in aerobic exercise and household chores has either remained grossly

similar or somewhat increased. However, three-fourth of the participants reported an increased sitting time and screen time during this pandemic period.

Participants reported mixed responses for sleep duration and sleep quality. Nearly half of the participants reported no gross change in both the duration and quality whereas another half reported increase and decrease in a similar ratio. The overall increase in stress and anxiety levels have been reported by 40% of the participants.

3.3. Validity of the questionnaire

A satisfactory level of agreement among panelists suggested good content validity. To ensure the face validity few items were modified to avoid ambiguity. Further, we established construct validity by using factor analysis. The degree of correlation was assessed through a correlation matrix. Sampling adequacy was established by Kaiser-Meyer-Olkin value (0.688) and the Bartlett test of sphericity (Chi-squared, df = 190; *P-value* <0.001), following which factor analysis was done, using the principal factor and varimax rotation to examine domain structure. Kaiser's criterion was used to enter the twenty items into the analysis. A total of six domains were identified after the factor analysis.

3.4. Reliability of the questionnaire

Cronbach's α coefficient was used to determine the internal consistency of the questionnaire. The value of Cronbach's α for our questionnaire came out to be 0.72 that suggests a good internal consistency. As such, questionnaires with the coefficient value of 0.7 or higher are considered to be internally consistent [12].

4. Discussion

COVID pandemic associated restrictions have led to serious disruptions in the daily routine of people. Lockdown at initial phases in the country led to the repercussions in the food supply and utilization thus placing the burden on usual food-related behaviour [13]. Moreover, the closure of gyms, fitness centres and restrictions imposed on visiting parks, playgrounds etc. to curb the spread of COVID has limited the access to many forms of physical activity [14,15]. Besides, confinement could have led to altered sleeping patterns [5]. Deviation from a healthy lifestyle can not only increase the risk of development of T2DM but also worsen the state of patients already suffering from it [6]. In view of the stated concerns, it is crucial to discover how significant is the impact of this pandemic and its associated restrictions on lifestyle-related behaviour of people including their eating habits, physical activity and sleep patterns.

This study is one of the first efforts in India to develop a validated questionnaire using a standardised procedure [8,9] that will help to assess the lifestyle-related behaviour of people during COVID pandemic. The developed questionnaire is a short, concise and user-friendly tool. It consists of 20 items covering all important information required to assess the dietary habits (intake, meal pattern and snack consumption), physical activity (duration and type) and sleep (duration and quality). The diet-related items of the questionnaire [1–14] assess the consumption of main meals, snacking habits, intake of healthy food items like whole grains, fruits and vegetables, eggs, nuts and consumption of unhealthy food items such as fried food, junk food, sugar-sweetened products. Besides, there are also few items dedicated to assessing the intake of immunity-boosting foods. In addition to this, some items (15–17) are pertaining to physical activity assessing the individuals' involvement in aerobic exercise, household-related activities,

sitting time and screen time. Questions determining sleep duration and its quality have also been included.

During this pandemic, researchers from various parts of the world have shown keen interest to assess lifestyle-related behaviour of people. However, the self-developed questionnaire used on the population of Poland [16] assesses only the dietary choices and habits of people during COVID pandemic. Moreover, the reliability and validity of their tool are questionable. In another study, the questionnaire used is not well applicable to Indian citizens [1]. No such attempt has been made yet in India to develop a validated questionnaire to assess lifestyle-related behaviour. We have developed this questionnaire that will be well applicable to our Indian population as well as other south-east Asian countries.

The questionnaire has several strengths. This is the first kind that has been developed to assess lifestyle-related behaviour during COVID pandemic among the general population in India. Our results support a good internal consistency, content validity, face

related behaviour during COVID pandemic, especially in the North Indian population. The tool with some minor modifications will be applicable to users in different regions also. This scale will help to provide valuable clues to public health policymakers, that too in a short period of time which becomes the priority in pandemic situations.

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Declaration of Competing interest

None.

Appendix A. Lifestyle related behaviour questionnaire

Instruction: For question numbers 1-20 select one of the following options as your response: *(a) Significantly increased (b) Slightly increased (c) Grossly similar (d) Slightly decreased (e) Significantly decreased*	
S. No.	Items of the questionniare Qrestions (items)
1	During COVID pandemic, how has your probability of skipping one of the main meals (breakfast/lunch/dinner) changed?
2	During COVID pandemic, how has your habit of snacking between meals changed?
3	During COVID pandemic, how has your quantity/portions of meals and snacks changed?
4	During COVID pandemic, how has your daily intake of fruits and vegetables changed?
5	During COVID pandemic, how has your intake of a balanced diet (including healthy ingredients such as whole wheat, pulses, legumes, eggs, nuts, fruits and vegetables) changed?
6	During COVID pandemic, how has your consumption of junk food/fast food and fried food changed?
7	During COVID pandemic, how has your intake of sugar-sweetened beverages (carbonated soft drinks, sugar-sweetened juices) changed?
8	During COVID pandemic, how has your consumption of sweets/candies/chocolate changed?
9	During COVID pandemic, how has your participation in cooking new/traditional recipes changed?
10	During COVID pandemic, how has your consumption of unhealthy food when you are bored or stressed or upset changed?
11	During COVID pandemic, how has your intake of immunity-boosting foods (lemon, turmeric, garlic, citrus fruits and green leafy vegetables) in the diet changed?
12	During COVID pandemic, how has your intake of nutrition supplements to boost immunity changed?
13	During COVID pandemic, how has the support of your family and friends in eating healthy changed?
14	During COVID pandemic, how has your interest in learning healthy eating tips from the media (newspaper articles/magazines blogs/videos/TV shows/text messages) changed?
15	During COVID pandemic, how has your participation in aerobic exercise changed?
16	During COVID pandemic, how has your participation in leisure and household chores changed?
17	During COVID pandemic, how has your sitting and screen time changed?
18	During COVID pandemic, how have your hours of sleep changed?
19	During COVID pandemic, how has your quality of sleep changed?
20	During COVID pandemic, how have your stress and anxiety levels changed?

validity and construct validity of this questionnaire. The questionnaire is also short, crisp, easy to comprehend, self-administered and does not require more than 5–7 min to administer. This questionnaire can assist in the quick assessment of lifestyle-related behaviour of people, thus beneficial, especially during pandemic situations. This will not only help the general population to keep a check on their routine but also on a broader scale can provide insights to public health policymakers so that they can take steps to prevent people from deviating so much from a healthy lifestyle.

There are also some limitations of this study that need to be pointed out. Firstly, the participants completing the survey for questionnaire development majorly belonged to North India. So, few changes in its dietary domain might be required to use it in different parts of our diverse country. Secondly, we have been unable to establish predictive/concurrent validity requiring long-term follow-up.

5. Conclusion

The lifestyle related behaviour questionnaire has good reliability and validity which makes it a suitable tool to assess the lifestyle-

Appendix B. Scoring instructions for the questionnaire to assess impact of COVID 19 on individual's lifestyle-related behaviour

Items 1, 2, 6, 7, 8, 9*, 10, 17 and 20 are scored as:
2 = Significantly decreased, 1 = Slightly decreased, 0 = Grossly similar, -1 = Slightly increased, -2 = Significantly increased.
Items 4, 5, 11, 12, 13, 14, 15, 16 and 19 are scored as:
2 = Significantly increased, 1 = Slightly increased, 0 = Grossly similar, -1 = Slightly decreased, -2 = Significantly decreased.
Item 3**, 18*** is scored as:
0 = Grossly similar-1 = Slightly increased/decreased-2 = Significantly increased/decreased
*Item 9 is scored assuming that these recipes are usually high in calories.
**Item 3 is scored assuming that the person was having normal portion of meals and snacks before COVID pandemic.
** Item 18 is scored assuming that the individual was having an

adequate 6-8 hours sleep before pandemic.

Clinicians may use their discretion and modify the scoring on case to case basis.

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