

Yoga Practice and Choices of Foods, Physical Activity, and Leisure: A Convenience Sampling Survey from India

Abstract

Background: Previous surveys from countries other than India reported positive health behaviors in yoga practitioners. The present study aimed to determine with respect to yoga practitioners in India: (i) percentages of yoga practitioners who consumed specific foods, had additional physical activity and leisure activity, (ii) the association between these choices and their yoga practice, and (iii) the association of yoga with adding or avoiding specific foods and with meal timings in a day. **Materials and Methods:** This convenience hybrid-mode sampling survey was conducted on 551 yoga-experienced persons. **Results:** (1) Yoga practitioner respondents ate fruits and vegetables regularly (62.1%), did not consume animal source products (69.2%), alcohol (98.0%), or tobacco (98.4%), had a regular physical activity other than yoga (77.5%) and leisure activities (92.2%). (2) More than 150 min/week of yoga practice and experience of yoga exceeding 60 months was (a) significantly associated with (i) regular consumption of fruits and vegetables, (ii) lower consumption of sugar-sweetened beverages, animal source foods, tobacco, and alcohol ($P < 0.05$, Chi-square test) and (b) not associated with physical activity or leisure activities ($P > 0.05$, Chi-square test). (3) Yoga practitioners excluded sugar-sweetened beverages, animal-source foods and fast foods from their diet, whereas they added fruits, vegetables, and plant-based juices to their diet, with earlier first and last meals for the day. **Conclusion:** In India, yoga practitioner respondents' choices for foods, physical activity, and leisure conform to accepted positive health behaviors. The exclusion of animal-source foods emphasizes the need for well-planned and fortified diets among vegan yoga practitioners.

Keywords: Food choices, leisure, meal timings, physical activity, yoga practice

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Introduction

Yoga includes specified postures, volitional breathing techniques, meditation, and suggestions for nutrition, physical activity, and leisure which are not obligatory.^[1,2] In India, yoga practice has gained in popularity to promote fitness and relieve stress.^[3]

Previously, in a US-based survey, the association of yoga with nutrition choices and physical activity was examined in 46 yoga practitioners.^[4] A positive association was found between yoga and healthy eating, along with the motivation to eat healthily. Furthermore, in a study on yoga practitioners sourced as a subset of the Australian Longitudinal Study on Women's Health, yoga practice was associated with a higher likelihood of a vegetarian or vegan diet.^[5] In the U.K., from a survey of yoga practitioners, yoga was found to positively impact health due to positive health behaviors.^[6]

However, there has been no study from India on the association between yoga practice and foods consumed, physical activity, and leisure choices.

Hence, the present study aimed to determine with respect to yoga practitioners in India: (i) percentages of yoga practitioners who consumed specific foods, had additional physical activity and leisure activity, (ii) the association between these choices and their yoga practice, and (iii) the association of yoga with adding or avoiding specific foods and meal timings in a day.

Materials and Methods

Respondents

The respondents to the survey were yoga practitioners whose practice was based on traditional yoga texts.^[7] Yoga practitioners of both sexes were sourced from different

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regions in India who (i) completed a training program from a yoga institution or (ii) were studying yoga at a state private university, both in north India. A hybrid of online and offline methods was used to recruit respondents. Respondents were recruited online from addresses of 500 yoga practitioners provided by the yoga institution on request, whereas the offline recruitment of 168 yoga practitioner students was by verbal announcements and flyers in the university. Participation in the survey was voluntary. Respondents were included if they were: (i) at least 15 years of age, (ii) practicing yoga for at least 3 months, and (iii) willing to participate. Respondents were excluded if they filled in the survey incompletely or incorrectly. A total of 585 responses were received; of these, 34 responses were excluded. Hence, the responses of 551 respondents (Male:female = 314:237) were analyzed. Informed consent was obtained from each respondent.

Study design

The study was carried out between December 2020 and March 2022. This cross-sectional, anonymous convenience sampling survey was administered using a hybrid of online and offline methods. Online survey administration was conducted as follows: (i) Yoga practitioners were telephonically invited to participate in the survey, followed by an E-mail invitation with a link to the survey prepared on Google Forms. (ii) Two telephone reminder calls (after 15 and 30 days of the E-mail invitation) were made to each yoga practitioner to collect the maximum possible responses. The survey was administered offline by distributing printed surveys in lecture halls of the university when students did not have lectures. Prior clearance from the institutional ethical committee was obtained to conduct the survey (approval number PRF/YRD/020/005).

Survey

Survey questions were drafted in English. However, it was expected that most respondents would prefer to communicate in Hindi. Hence, the questions were translated to Hindi with the assistance of two bilingual experts using standard procedure.^[8]

The survey had three parts. The first part of the survey determined respondents': (a) sociodemographic characteristics (i.e., age, gender, and education) and (b) yoga practice-related characteristics (i.e., [i] minutes of yoga/week [based on yoga practice minutes/day X number of days/week a respondent practiced yoga], and [ii] experience of yoga practice [in months]). The second part of the survey was designed to determine the choices of foods, physical activity, and leisure activities of yoga practitioners. The third part of the survey determined the association of yoga with foods participants added to/removed from their diet and with their meal timings in a day. The second and third parts of the survey are depicted in Figure 1. The survey questions were selected by the

corresponding author, who has over 30 years of experience of practicing and researching yoga.

Data cleaning

Two researchers independently scrutinized the completed surveys to determine whether a respondent fulfilled the criteria for inclusion (i.e., at least 15 years of age and practicing yoga for a minimum of 3 months before the survey) and exclusion (i.e., whether a respondent filled the survey incompletely or incorrectly). A total of 585 responses were received. Of these, 34 responses were excluded as the surveys were filled incompletely or incorrectly. Hence the responses from 551 respondents were analyzed.

Data analysis

The data analysis was carried out in three parts. (A) Percentages of respondents were obtained for those who (1) consumed fruits, vegetables, eggs, fish/seafood, meat, alcohol, and tobacco, (2) had a regular physical activity other than yoga, and (3) had a leisure activity. (B) The association was calculated (Chi-square test, IBM SPSS (Version 24.0, New York, USA)) between (1) yoga practice-related factors, i.e., (a) minutes of yoga practice in a week or (b) experience of yoga in months and (2) percentages of respondents who (a) consumed fruits, vegetables, eggs, fish and seafood, meat, alcohol and tobacco, (b) had a regular physical activity other than yoga, and (c) had a leisure activity. (C) The association of yoga with (1) foods included in the diet and foods excluded from the diet and (2) meal timings (i.e., specifically, the timings of the first and last meals of the days) was obtained from the responses to direct questions and converted to percentages.

For Chi-square tests, Cramer's V was determined if there was a significant association between percentages of respondents obtained for (A) those who (1) consumed fruits, vegetables, eggs, fish and seafood, meat, alcohol, and tobacco, (2) had a regular physical activity other than yoga and (3) had a leisure activity and (B) their yoga practice based on the Chi-square test. Cramer's V >0.10 was considered the critical value to report a moderate association between variables.

Results

Five hundred and fifty-one respondents completed the survey satisfactorily and their responses were analyzed. The baseline characteristics of the respondents are given in Table 1. The sample size was not calculated *a priori*. However, the *post hoc* analysis was carried out to determine the power of the study. The present study (with $n = 551$, level of significance $[\alpha] = 0.05$, and Cohen's $w = 0.25$ [determined from the association of time spent practicing yoga/week associated with consumption of fruits]) had power equal to 0.9986.

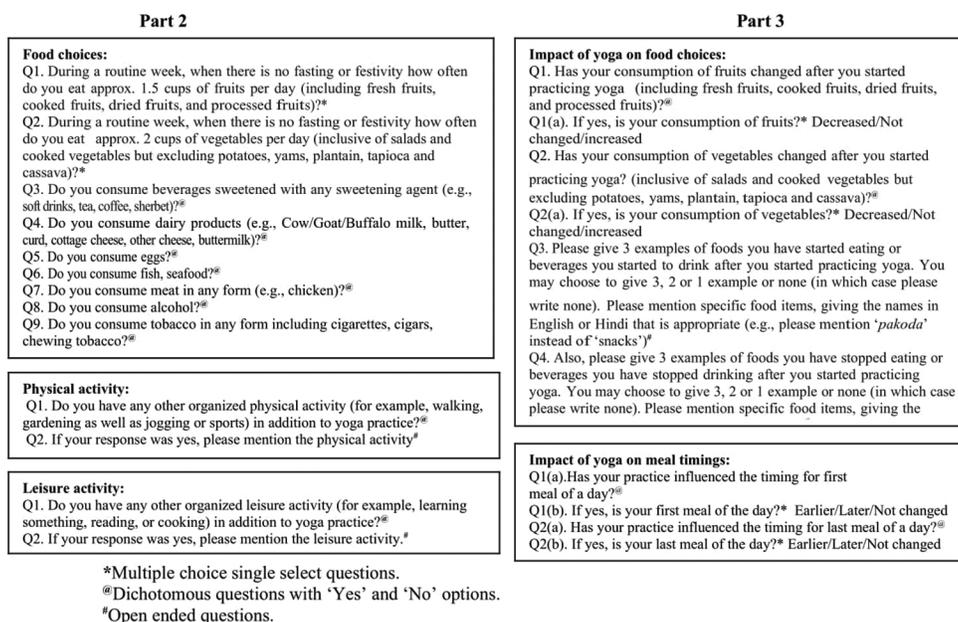


Figure 1: Part two and three of the survey questions

Sociodemographic characteristics

The respondents were of both genders comparably (males = 57.0%), more frequently between the ages of 15 and 30 years (44.3%), educated up to graduation (i.e., 15 years of education, 49.5%) and those with both (i) less than or (ii) greater than 60 months of experience in yoga were comparable in number (i.e., 50.8% had over 60 months experience of yoga).

Respondents' food choices, physical activity, and leisure

A total of 72.1% of respondents reported regular consumption of vegetables, whereas 52.1% reported regular consumption of fruits. Of the total respondents, 60.0% consumed sugar-sweetened beverages, while 85.5% used dairy products. The majority of respondents did not consume eggs (79.5%), fish or seafood (90.9%), meat (91.8%), alcohol (98.0%), or tobacco in any form (98.7%).

Among 551 respondents, 77.5% had a physical activity in addition to yoga practice. The three most common physical activities reported were: (i) walking (35.4%), (ii) playing games (7.7%), and (iii) jogging (6.3%).

A total of 92.2% of respondents reported having leisure activities. The most common leisure activities were: (i) listening to music (48.3%), (ii) gardening (10.2%), and (iii) reading (9.8%).

Association of yoga practice-related factors with respondents' (1) food choices, (2) physical activity, and (3) leisure

The following associations between time spent practicing yoga and specific responses about foods chosen were

Table 1: Sociodemographic characteristics of the respondents (n=551)

Characteristics	Percentage
Age group (years), mean±SD	36.7±15.3
Age (range)	15–77
Gender (male: female)	
Actual values	314:237
Percentage values	57:43
Education	
High school	17.8
Graduate	49.5
Postgraduate and above	32.7
Type of diet	
Vegan	11.4
Lacto-vegetarian	65.5
Ovo-vegetarian	2.0
Lacto-ovo-vegetarian	9.2
Nonvegetarian	11.9
Yoga experience (months)	
4–12	12.5
13–60	36.7
Above 60	50.8

SD: Standard deviation

significant ($P < 0.05$ for all comparisons, Chi-square tests). Respondents with over 300 min/week of yoga practice were (a) more likely to consume fruits regularly (Cramer's $V = 0.12$) and (b) less likely to consume eggs (Cramer's $V = 0.15$) or tobacco (Cramer's $V = 0.12$; also likely for practice levels <150 min/week) compared with other yoga practice levels. Respondents with 150–300 min/week of yoga practice were less likely to consume (i) fish/seafood (Cramer's $V = 0.16$), (ii) meat (Cramer's $V = 0.25$),

and (iii) alcohol (Cramer’s V = 0.11) than other yoga practice levels.

There were also significant associations between the experience of yoga in months and specific responses about foods chosen ($P < 0.05$ for all comparisons, Chi-square tests). Respondents with 60 or more months of experience in yoga were (a) more likely to consume (i) fruits regularly (Cramer’s V = 0.11) and (ii) vegetables regularly (Cramer’s V = 0.12), (b) less likely to consume (i) sugar-sweetened beverages (Cramer’s V = 0.16), (ii) eggs (Cramer’s V = 0.16) and (iii) meat (Cramer’s V = 0.10). The association of respondent’s food choices with yoga practice-related factors is given in Table 2.

There was no significant association between whether a respondent had (i) physical activity in addition to yoga and (ii) a leisure activity with yoga practice-related factors (i.e., time spent practicing yoga/week and experience of yoga [in months]; $P > 0.05$, Chi-square test for all comparisons).

The association of yoga with adding or avoiding specific foods and meal timings in a day

There was an increase in consumption of fruits in 59.0% and of vegetables in 54.5% of respondents after they started practicing yoga (this was based on the question, i.e., “Has your consumption of fruits/vegetables changed after you started practicing yoga”).

Of the total respondents, 65.7% reported that they had introduced specific foods or beverages to their diet after starting to practice yoga. Of these, the three most common foods or beverages were: (i) fruits (19.2%), (ii) vegetables (14.7%), and (iii) plant-based juices (12.2%).

A total of 65.3% of respondents reported having stopped eating specific foods and beverages after starting to practice yoga. Of these, the three most common foods and beverages which respondents stopped eating were: (i) sugar-sweetened beverages (26.0%), (ii) fast foods (22.7%), and (iii) animal-source foods (19.6%).

Of the total respondents, 72.4% reported that yoga had influenced the timing for the first meal of the day. Of these respondents, 63.7% reported that they had started having the first meal of the day earlier than before. Furthermore, 72.4% of the respondents reported that yoga had influenced the timing for their last meal of the day. Of these respondents, 67.9% of the respondents reported that they had started having the last meal of the day earlier than before.

The impact of yoga on food choices and timing of the first and last meals is shown in Table 3.

Discussion

Among 551 yoga practitioners in India, 69.2% did not consume animal source products, while 62.1% consumed

Table 2: Food choices of the yoga practitioner respondent’s in relation to yoga practice-related factors

Characteristics	Categories	n	Food choices																			
			Fruits/week [§]			Vegetables/week [§]			Sweetened beverages [§]		Dairy products		Eggs [§]		Fish/seafood [§]		Meat [§]		Alcohol [§]		Tobacco [§]	
			Rarely	Often	Always	Rarely	Often	Always	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time spent practicing yoga/week (min)	<150	22	59.1	36.4	4.6	27.3	40.9	31.8	63.6	36.4	81.8	18.2	40.9	59.1	22.7	77.3	31.8	68.2	5.8	94.2	5.8	94.2
	160–300	52	55.8	32.7	11.5	32.7	28.9	38.5	67.3	32.7	80.8	19.2	30.8	69.2	5.8	94.2	3.9	96.2	1.7	98.3	0.8	99.2
	above 300	477	45.5	30.2	24.3	27.5	30.2	42.4	58.9	41.1	86.0	14.1	18.5	81.6	8.8	91.2	7.6	92.5	0.0	100.0	1.5	98.6
Yoga experience (months)	4–12	69	63.8	23.2	13.0	43.5	31.9	24.6	65.2	34.8	84.1	15.9	31.9	68.1	15.9	84.1	14.5	85.5	3.5	96.5	2.0	98.0
	13–60	202	49.5	34.7	15.8	31.2	34.2	34.7	74.8	25.3	89.6	10.4	29.7	70.3	10.4	89.6	11.9	88.1	1.4	98.6	0.7	99.3
	above 60	280	41.1	29.6	29.3	21.8	27.5	50.7	47.9	52.1	82.5	17.5	11.1	88.9	6.4	93.6	3.9	96.1	2.5	97.5	1.2	98.8

[§] $P < 0.05$: Chi-square test for association between time spent in practicing yoga and related food choices, ^{*} $P < 0.05$: Chi-square test for association between overall yoga experience in months and related food choices

Table 3: Impact of yoga on fruits and vegetables consumptions according to yoga practice-related factors

Characteristics	Categories	n	Fruits consumption ^{§§}				Vegetables consumption [§]				Change in the timings for meal						
			Decreased	Increased	NC	NC	Decreased	Increased	NC	NC	Last meal of the day						
										First meal of the day							
										1	2	3	4	1	2	3	4
Time spent practicing yoga/week (min)	<150	22	18.2	45.5	36.4	9.1	45.5	45.5	45.5	40.9	27.3	4.5	27.3	27.3	18.2	4.6	50.0
	160-300	52	5.8	73.1	21.2	3.9	71.2	25.0	25.0	15.4	36.5	5.8	42.3	5.8	40.4	11.5	42.3
Yoga experience (months)	above 300	477	8.2	58.1	33.8	5.2	53.0	41.7	41.7	19.7	48.0	4.0	28.3	12.0	51.6	9.9	26.6
	4-12	69	17.4	46.4	36.2	8.7	46.4	44.9	44.9	26.1	39.1	4.3	30.4	18.8	47.8	8.7	24.6
	13-60	202	8.9	64.4	26.7	5.9	52.5	41.6	41.6	18.8	45.5	4.0	31.7	11.9	47.0	8.9	32.2
	above 60	280	5.7	58.2	36.1	3.9	57.9	38.2	38.2	19.6	48.2	4.3	27.9	10.4	51.1	10.7	27.9

[§]P<0.05: Chi-square test for association between time spent in practicing yoga and related food choices and timings for meals, ^{§§}P<0.05: Chi-square test for association between overall yoga experience in months and related food choices and timings for meals. 1: Later than before you have started practicing yoga, 2: Earlier than before you have started practicing yoga, 3: Omitting the meal, 4: No change in the timing of the meal. NC: Not changed

fruits and vegetables most days of a week. The percentages of respondents consuming animal-source foods, alcohol, or tobacco were lower than the national statistics in India,^[9] with higher percentages of respondents consuming fruits and vegetables.^[9]

While greater consumption of fruits and vegetables and lower consumption of alcohol and tobacco is considered likely to promote health and prevent certain diseases, a diet devoid of animal source products should be well-planned with a wide variety of plant foods and a reliable source of Vitamin B12 (vitamin fortified foods or supplements) to ensure adequate nutrient intake and prevent vitamin deficiencies.^[10]

Longer time spent practicing yoga in a week and longer experience of yoga in months were significantly associated with regular consumption of fruits and vegetables and lower consumption of animal-source foods, alcohol, and tobacco. This may suggest that respondents with a longer duration of yoga experience were established in healthy lifestyle choices.

The impact of yoga on eating behavior was based on respondents' replies to direct questions about whether yoga had influenced their food choices and meal timings. When asked if they had added any foods or beverages to their diet after they started practicing yoga, respondents most often specifically added both fruits and vegetables to their diet, which is considered beneficial to health.^[11] This response was especially reported in respondents with between 150 and 300 min of yoga practice in a week. Parallel to their yoga practice, respondents also added plant-based juices (e.g., the juice of *Aloe vera L.* and of *Emblica officinalis*) to their diet, which are known to have antioxidant and anti-inflammatory activities.^[12,13] Respondents also reported that they had stopped eating certain foods once they practiced yoga, especially sugar-sweetened beverages, animal-based foods (e.g., meat, fish, eggs, and dairy products), and fast foods (including deep-fried foods). In 73.48% of respondents who had more than 300 min of yoga practice in a week, respondents reported that they had both their first and their last meal of the day earlier than before they practiced yoga. While the impact of meal timings on health is complex and determined by multiple factors, including circadian rhythms, there are reports that among those who have a late last meal of the day during the 2 h before sleep, the probability of being obese increases five times, while in those who consume their first meal of the day 2 h after wake time the probability of developing obesity decreases by 50%.^[14] Hence, on the whole respondents' reported impact of yoga practice on eating behavior as changes which promote positive health.

These findings are similar to those of a previous study which used mixed methods (i.e., a survey and semi-structured interviews) to determine the association

between yoga practice and dietary behaviors in 46 young adult yoga practitioners in the US.^[4] In the U.S. based study also, regular yoga practice was associated with more servings of fruits and vegetables and lower consumption of snacks and fast foods. Unlike the present study conducted in India, there was no clear association between yoga practice and reduced consumption of animal-source foods. However, in yoga practitioners sourced as a subset of the Australian Longitudinal Study on Women's Health, yoga/meditation practice was more often associated with a vegetarian or vegan diet and with marijuana and drug use.^[5] Furthermore, in the UK, from a survey of 2434 yoga practitioners, yoga was perceived to have a positive impact on physical and mental health conditions and was linked to positive health behaviors.^[6] The similarities and differences between the impact of yoga on food choices in the present study conducted in India, compared to previous studies in the US,^[4] Australia,^[5] and the UK^[6] highlight the common features and differences in yoga practitioners across different regions globally.

The high percentage of lacto-vegetarian respondents can be connected with the origins and beliefs of yoga philosophy. Yoga is documented as a philosophical system including both orthodox and heterodox Indic traditions.^[7,15] Vegetarianism is encouraged in yoga texts to enhance equipoise which is an aim of yoga.^[2] Furthermore, the principle of nonviolence (*ahimsa*) forms the first ethical restraint (*yama*) in Patañjali's Yoga Sutras, a seminal text on yoga.^[7]

Among the present yoga practitioner respondents, 77.5% had some physical activity in addition to yoga every day. There was no association between adopting such a physical activity and respondents' duration of yoga practice per week or experience of yoga in months. Most often, respondents included any of the following: walking (35.4%), group sports (7.7%), and jogging (6.3%) as their choices of additional physical activity. Previously similar to the present results, yoga practice was associated with moderate-to-vigorous physical activity in a US-based survey^[4] and with at least moderate physical activity in a survey from Australia.^[5] Both brisk walking and jogging positively influence physical health; hence, in the present study, these activities can be expected to benefit health.^[16]

Ninety-two percent of respondents had a regular leisure activity such as (i) listening to music (48.3%), (ii) gardening (10.2%), and (iii) and reading (9.8%). Gardening has multiple benefits associated with being in nature and physically active,^[17] while music activities offer a rich and underutilized resource for health.^[18] Hence, these leisure activities could be beneficial to health.

Before summarizing the findings, the study limitations are mentioned here. The present survey results were based on respondents' self-reports. It would have been ideal to use more objective methods, such as respondents' use

of wearable cameras;^[19] though this would be difficult to implement in the present sample who had varying levels of literacy and familiarity with such techniques. Similarly, the use of observation (e.g., by a member of the family or close associate) could have been tried with training the observer.^[20] It is worth noting that the self-report method used in this survey was the basis of associations between yoga and foods consumed in previous surveys conducted in the US,^[4] UK,^[6] and Australia.^[5] Hence, the percentages obtained in these surveys may also be expected to reflect errors in reporting.

In any attempt to establish an association, such as the association between yoga practice and lifestyle choices, there may be various additional factors that influence the association. Hence in the present study additional factors may have influenced the association between yoga practice and lifestyle choices. These confounding variables cannot be ruled out and is also a limitation of the present study. Finally, these findings are limited by the absence of a comparative group of respondents who did not practice yoga for comparison.

Conclusion

1. In this survey from India, yoga practitioner respondents ate vegetables and fruits regularly (62.1%), did not consume animal source products (69.2%), alcohol (98.0%), or tobacco (98.4%), had a regular physical activity other than yoga (77.5%) and leisure activities (92.2%). This is comparable to other countries though consumption of animal-source foods is lower
2. More than 150 min/week of yoga practice and 60 months experience of yoga was (a) positively associated with (i) regular consumption of fruits and vegetables, (ii) lower consumption of sugar-sweetened beverages, animal source foods, tobacco, and alcohol and (b) not associated with physical activity or leisure activities
3. Yoga practitioner respondents excluded sugar-sweetened beverages, animal-source foods, and fast foods from their diet, whereas they added fruits, vegetables, and plant-based juices to their diet along with earlier first and last meals for the day
4. The exclusion of animal-source foods emphasizes the need for well-planned and fortified diets among vegan yoga practitioners in India.

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Conflicts of interest

There are no conflicts of interest.

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