Abstract

**Introduction:** Processed and preserved food items are the major source of dietary trans fat. Despite various legal provision, public awareness toward trans fats are limited. **Objective:** To examine the awareness of participants about various aspects of trans fats and improving their knowledge through education. **Methods:** A cross sectional pre- and posttest survey was conducted online through a webinar. The questionnaire has 11 questions about trans fats. Received responses were coded. Mean and frequency of continuous data were calculated. Chi-square or t-test were used to find the difference in pre and posttest. **Results:** Eighty five out of 95 participants completed both pre- and posttest. The scores for each question were compared to find out awareness improvement. The question based on FSSAI showed 57% improvement while 50% in case of World Health Organization’s REPLACE initiative. The difference of mean score of pretest (7.57 ± 1.8) and posttest (9.22 ± 1.37) was statistically significant. **Conclusion:** Nutrition education and proper labelling of food items can improve the knowledge about food ingredients and food purchasing patterns. Proper enforcement and monitoring of food items labeling guidelines can be recommended.

**Keywords:** Dietary trans-fat, food package labeling, food purchasing behaviors, trans fat

**Introduction**

It has been estimated by World Health Organization (WHO) that every year intake of trans-fat causes more than 500,000 deaths globally and 77,000 deaths in India from cardiovascular disease due to increased low-density lipoprotein level.\(^1\) With increasing commercialization of processed and preserved foods, people are more inclined toward the consumption of trans fatty acid-rich foods which mainly come from industrial sources by process of partial hydrogenation of edible oil and from transformation of unsaturated fatty acids in the rumen of ruminants by the bacteria.\(^2,3\) The key sources of transfats are cookies, crackers, cakes, margarine, animal products, fried potatoes, popcorn, sweets, and desserts.\(^4\)

Intake of trans fatty acids is quite soaring in many countries, especially in middle- and low-income countries wherein partially hydrogenated vegetable oils (PHVO) usage is remarkably high; with India being one of them where vanaspati PHVO are replacing the clarified butter (traditional ghee) considering its cheaper availability and price.\(^5\) With increasing consumption and adverse effects of partially hydrogenated oil, these trans fats are no longer considered as safe by Food and Drug administration due to its deleterious health effects.\(^6,7\)

Hence, to mitigate the adverse health consequences of trans fats, several countries such as Denmark have virtually eliminated, limited, and have put a legally ban on the consumption of industrially produced trans fats through imposing limits on the amount in the packaged food.\(^8\)

In addition, the WHO also recommends that trans fats intake should be limited to 1% of total energy intake and has called for the reduction and elimination of these harmful fatty acids from the food supply chain globally by releasing the REPLACE action package.\(^9\) According to dietary requirements of fats,
Trans fatty acids should be restricted to <1% of energy and saturated fats to <10%.\(^{[10]}\)

Although many legislations and laws have been in place for the elimination of industrially produced trans fatty acids, the public knowledge of trans fat in foods is unsatisfactory without much accessibility of reliable data.\(^{[11,12]}\) Reformulation of food products and spreading awareness to the manufacturers and consumer is the most effective tool for eliminating the trans fats from the daily routine.\(^{[13]}\) Hence, a survey was felt needed realizing the adverse health consequences of trans fats and to reduce their consumption in the entire participants by assessing their level of awareness about trans fats and increasing their knowledge of indulging in healthy food choices with appropriate education programs while encouraging the participants to check the nutritional label of packaged food before consuming.

**METHODS**

The present study was cross-sectional and was conducted online through a webinar using an online survey platform with a pre- and post-test designed questionnaire to determine the knowledge, awareness, and practices regarding transfat among participants. The study was ethically approved by the Institute’s Ethics Committee, Postgraduate Institute of Medical Education and Research, Chandigarh (PGI/IEC/09/2019–1387). A total of 95 participants responded in pretest questionnaire and 86 participants responded in posttest. All the subjects were explained about the purpose of the study, and data were collected through Google Forms circulated at the start and the end of the webinar.

After the data collection, coding was done. The correct response/answer was scored as 1 and incorrect as 0. The data were then tabulated, and percentages for frequency distribution and mean ± standard deviation for continuous variables were calculated. The descriptive statistics were used for percentage variable. The statistical differences between the pre- and post-test score and responses were assessed using Chi-square test or \(t\)-test. The statistical significance was considered at \(\alpha < 0.05\), and data were analyzed using SPSS Version 26.0 for Window of (IBM Corp., Armonk, New York, USA).

**RESULTS**

The webinar included pre- and post-test questionnaires to assess the gain of knowledge among the participants. The pretest included total \(n = 95\) responses, whereas posttest included \(n = 86\) responses.

The questionnaire included 11 questions based on trans fat topic in both pre and posttest. The question #1 showed 8% improvement, question #4 showed ~11% improvement, and question #7 based on REPLACE initiative depicted ~50% increase in positive responses (yes) in posttest. Question #9 and #10 showed 57% and 39% improvement in positive responses (yes) respectively. The questions like “Q1. Do you know what are trans fats?”, Q4. Do you know about PHVO?, Q7. Do you know about REPLACE initiative taken by WHO?, Q9. Do you have any idea about FSSAI initiative to eliminate trans fats in India?, and Q10. Have you seen the trans fat FSSAI logo? show significant differences among pretest and posttest responses [Table 1]. The question no. 3, 6, 5, 8, and 11 showed an increase in positive responses (yes and correct) at posttest but the increase was not found to be significant. Question number 2 showed arbitrary results which is contradictory with other responses. The mean score at pretest and posttest was 7.57 ± 1.8 and, 9.22 ± 1.37 respectively. The difference between scores at pretest and posttest was recorded to be statistically significant (<0.001) [Table 2]. This shows an improvement in the knowledge based on trans fats of respondent pertaining to the webinar.

**DISCUSSION**

Poor nutrition during the vital points of life can have a significant outcome, which may give rise to long-term health effects. To generate awareness and understanding of trans fats among the people, the present study was done to determine the impact of nutrition awareness on consumers’ knowledge, attitude, and behavior toward trans fatty acids in food products. Trans fatty acids is consistently interlinked with the risk of coronary heart disorders contributing to the global burden of disease. In rural as well as urban India, the intake of fats is generally around 20 and 30 g/day according to the studies (National Consumption Survey data by NIN 2009).\(^{[14]}\)

On comparing the results obtained from pretest and posttest, improvement in terms of awareness, knowledge, and practices was observed. The results showed that 92% of participants did not know about the transfat which however increased to 100% after education intervention supporting the results of the study conducted by Cognet Research, in which awareness of trans fat increased in a 1 year study.\(^{[15]}\)

According to a study conducted in a urban commuter college, out of 222 college students 37% of participants reported never checking trans fat information on a food label while consuming\(^{[16]}\) which supports our survey, in which 10.5% did not check labels which however reduced to 5.8% postwebinar showing the enhancement in their attitude and knowledge.

Although various initiatives have been taken by various agencies at national and international level for reducing the trans fat intake in the food supply, still most of the consumers are unaware of such legislations and agencies.

In this study, responses to question pertaining to the initiative taken by FSSAI\(^{[13]}\) preeducation intervention was 34.7% which significantly improved to 91.8%.

On comparing the results postintervention, it was found that only 34.7% were aware of the replace initiative taken by
WHO. However, education sessions significantly improved the awareness regarding the initiatives among 84.8% of the subjects. The initiative was planned in response to adverse effect of the harmful effects of trans fats by ensuring sustained elimination of industrially produced transfats.

According to the results obtained, very slight improvement in terms of knowledge of industrially produced trans fats and food purchasing behaviours among the respondents which was almost less than 10%, however not significant.

Significant results ($P < 0.001$) were obtained for the question on the trans fat logo which showed improvement from 48.4% to 87.2% postwebinar highlighting the importance of FSSAI logo on the food labels.

Considering the country India, PHVO are consumed principally through vanity, street vendor foods, baked foods, and vegetable ghee used as cooking oil and in fried snacks. In the present study, more than half of the participants were aware of hydrogenated vegetable oils in prewebinar and showed improvement in awareness to nearly 6%.

The present study observed that more than half of the participants, i.e., 61% were aware of the trans fat limit in India prewebinar, which however improved to nearly 2% more postwebinar.

Combining oils is the best way which can be used by the food industry to replace artificially produced trans fats, almost 5% increase in knowledge among respondents was found postwebinar.

Isomers of trans fats formed by the process of hydrogenation have adverse effects on health and with the support of recent

### Table 1: The distribution of responses at pre ($n=95$) and post ($n=86$) test

| Questions                                                                 | Responses | $\chi^2$, $P$ |
|--------------------------------------------------------------------------|-----------|--------------|
| Q 1. Do you know what are trans fats?                                    | Pre       | 88 (92)      |
|                                                                           | Post      | 86 (100)     |
| Q 2. Is there any difference between natural and artificial/industrial produced trans fats? | Pre       | 92 (96.8)     |
|                                                                           | Post      | 81 (94.1)     |
| Q 3. Are industrial produced trans fats hazardous?                        | Pre       | 89 (93.6)     |
|                                                                           | Post      | 83 (96.5)     |
| Q 4. Do you know about partially hydrogenated vegetable oils?             | Pre       | 81 (85.2)     |
|                                                                           | Post      | 83 (96.5)     |
| Q 5. Do you check label on packaged products?                             | Pre       | 85 (89.4)     |
|                                                                           | Post      | 81 (94.1)     |
| Q 6. Do you buy unpackaged food items?                                    | Pre       | 31 (32.63)    |
|                                                                           | Post      | 24 (27.9)     |
| Q 7. Do you know about replace initiative taken by WHO?                   | Pre       | 33 (34.7)     |
|                                                                           | Post      | 73 (84.8)     |
| Q 8. Presently, what is the trans fats limit in India? (correct knowledge) | Pre       | 58 (61.0)     |
|                                                                           | Post      | 54 (62.7)     |
| Q 9. Do you have any idea about FSSAI initiative to eliminate trans fats in India? | Pre       | 33 (34.7)     |
|                                                                           | Post      | 79 (91.8)     |
| Q 10. Have you seen the trans-fat FSSAI logo?                             | Pre       | 46 (48.4)     |
|                                                                           | Post      | 75 (87.2)     |
| Q 11. Best combination of oils can be used by industry to replace artificially produced trans fats? | Pre       | 35 (36.8)     |
|                                                                           | Post      | 36 (41.8)     |

Figures in parenthesis indicate percent values.

### Table 2: Mean±standard deviation values of pre- and post-test scores

| Total | n   | Mean±SD   | $t$-test, $P$ |
|-------|-----|-----------|--------------|
| Pretest | 95 | 7.57±1.8  | 6.9          |
| Posttest | 86 | 9.22±1.4  | <0.001       |

SD: Standard deviation
The overall difference between scores at pretest and posttest was found to be significant (<0.001), which shows an improvement in the knowledge based on trans fats of respondents pertaining to the webinar.

**Conclusion**

The elevated use of trans fats in the global food chain and current evidences identifying negative health effects underscore the need to sensitize the public on trans fats; double trouble for the heart health. With the lower level of awareness among people, the results recommend that nutrition education sessions and greater transparency in food labels may contribute an improvement in consumer knowledge and their attitude towards food purchasing patterns. Considering the greater amount of trans fats in fried foods and snacks, the best possible way to prevent the adverse health effects is to avoid trans-fatty acids containing foods. To keep oneself updated regarding the trans fats content, it would be helpful to purchase packed foods from reliable source. Strict monitoring of marketing methods and packaged food labels can be recommended for providing reliable information.

**Acknowledgments**

The authors are grateful to Global Health Advocacy Incubator (GHAI) for supporting the study and the contribution of webinar attendees who participated in the study.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. WHO Plan to Eliminate Industrially-Produced Trans-Fatty Acids from Global Food Supply; 2018. 1. [Last accessed on 2021 Oct 01].
2. Oteng AB, Kersten S. Mechanisms of action of trans fatty acids. Adv Nutr 2020;11:697-708.
3. Musavi A, Tekin A, Erinç H. Formulation of trans-free margarines using hydrogenated and interesterified palm olein. J Oil Palm Res 2011;23:1153-8.
4. Te Morenga L, Montez JM. Health effects of saturated and trans-fatty acid intake in children and adolescents: Systematic review and meta-analysis. PLoS One 2017;12:e0186672.
5. Raj MA, Reddy AG, Reddy AR, Adilaxamma K. Effect of dietary vanaspati alone and in combination with stressors on soro-biochemical profile and immunity in white leghorn layers. Toxicol Int 2011;18:31-4.
6. FDA. Trans Fat; 2018. Available from: https://www.fda.gov/food/food-additives-petitions/trans-fat. [Last accessed on 2021 Oct 01].
7. Dhaka V, Gulia N, Ahlawat KS, Khatkari BS. Trans fats-sources, health risks and alternative approach – A review. J Food Sci Technol 2011;48:534-41.
8. Parziale A, Ooms G. The global fight against trans-fat: The potential role of international trade and law. Global Health 2019;15:46.
9. Nishida C, Uauy R. WHO scientific update on health consequences of trans fatty acids: Introduction. Eur J Clin Nutr 2009;63 Suppl 2:S1-4.
10. de Souza RJ, Mente A, Maroulian G, Cozma AI, Ha V, Kishiibe T, et al. Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: Systematic review and meta-analysis of observational studies. BMJ 2015;351:h3978.
11. Downs SM, Thow AM, Ghosh-Jerath S, McNab J, Reddy KS, Leeder SR. From Denmark to Delhi: The multisectoral challenge of regulating trans fats in India. Public Health Nutr 2013;16:2273-80.
12. Ascherio A, Willett WC. Health effects of trans fatty acids. Am J Clin Nutr 1997;66:1006S-10S.
13. Iqbal MP. Trans fatty acids – A risk factor for cardiovascular disease. Pak J Med Sci 2014;30:194-7.
14. Banseria R, Gothwal S, Dixit S, Saroshe S. A cross-sectional study to assess the awareness of the presence of trans-fat in packaged food items and their harmful effects in a metropolitan city of central India. Int J Med Sci Public Health 2016;5:1.
15. Eckel RH, Kris-Etherton P, Lichtenstein AH, Wylie-Rosett J, Groom A, Stitzel KF, et al. Americans’ awareness, knowledge, and behaviors regarding fats: 2006-2007. J Am Diet Assoc 2009;109:288-96.
16. Jasti S, Kovacs S. Use of trans fat information on food labels and its determinants in a multiethnic college student population. J Nutr Educ Behav 2010;42:307-14.
17. FSSAI. FSSAI Slashes Limit for Trans Fat Levels in Foods; 2021. Available from: https://www.thehindu.com/sci-tech/health/fssai-slashes-limit-for-trans-fat-levels-in-foods/article33486031.ece. [Last accessed on 2021 Oct 01].
18. L’Abbé MR, Stender S, Skeaff CM, Ghafoorunissa, Tavella M. Approaches to removing trans fats from the food supply in industrialized and developing countries. Eur J Clin Nutr 2009;63:S50-67.
19. Gogtay NJ, Sheth HJ, Maurya MR, Belhekar MN, Thatte UM. A literature review of consent declines and consent withdrawals in randomized controlled trials conducted during the COVID-19 pandemic. J Postgrad Med 2021;67:134-8.
20. Hashempour-Baltork F, Torbati M, Azadmard-Damirchi S, Peter Savage G. Chemical, rheological and nutritional characteristics of sesame and olive oils blended with linseed oil. Adv Pharm Bull 2018;8:107-13.