ORIGINAL ARTICLE

Study on knowledge, attitude and consumption behaviour regarding dietary Trans fats and estimation of the Trans fat levels in commonly consumed fried street foods in Pali city

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ABSTRACT

Introduction: Cardiovascular diseases are identified as the foremost cause of death globally. Several major risk factors contribute to these diseases, including unhealthy eating habits, physical inactivity and using tobacco and alcohol. The use of trans fats has risen considerably in recent years. This increase is largely due to them being generally less expensive than healthier alternatives. **Objectives:** 1. To study the knowledge, attitude and consumption behaviour of trans-fats among residents of Pali city 2. To estimate the amount of trans fats in top 5 commonly consumed fried foods in the district. **Methods:** Community based observational cross-sectional study at District Hospital/ Urban Health Training Centre (UHTC) and Rural Health training centre (RHTC) of Government Medical College Pali. Data on various socio-demographic variables, knowledge, attitude and consumption behaviour about dietary trans fats was documented. The analysis of trans fat in food items was done at Omega Test House, Jaipur. **Results:** A total of 409 participants were enrolled for the study.70.66% (289) participants reported being unaware of trans fats, and 68.9% (282) did not know the difference between natural and artificial trans fats. 50% of the participants were unaware of partially hydrogenated vegetable oils. 46% (188) stated they never checked labels for trans fat content on packaged food items. Despite the lack of awareness, 77% (315) expressed a willingness to reduce their trans fat intake, and 92.7% (379) agreed to adopt dietary changes to do so. **Conclusion**. There is a clear need to increase public awareness regarding trans fats, especially in light of the rising burden of non-communicable diseases.

KEYWORDS

Transfat, Knowledge, Attitude, Consumption Behaviour

INTRODUCTION

Trans-fatty acids (TFA) are defined as fatty acids that contain at least one double carbon-carbon bond arranged in a trans configuration. These fats are created by industry through a process called partial hydrogenation of vegetable and fish oils. However, TFA also exist naturally, although in smaller quantities, in the meat and dairy products derived from ruminant animals like cattle, sheep, goats, and camels. The primary source of dietary TFA is those produced industrially for many populations(1).

Cardiovascular diseases are identified as the foremost cause of death globally. Several major risk factors contribute to these diseases, including unhealthy eating habits, physical inactivity and using tobacco and alcohol.

Among various dietary factors, a high consumption of trans fat is particularly harmful. High intake of trans fat is linked to a 34% higher risk of death from any cause. It increases the risk of death specifically from coronary heart disease by 28% and the risk of developing coronary heart disease itself by 21%. Trans fat offers no known health benefits (2).

Trans-fatty acids (TFA) can influence several lipid-related and non-lipid-related factors that contribute to cardiovascular disease. They stimulate systemic inflammation by raising C-reactive protein (CRP) levels, which in turn promotes arterial thickening (atherosclerosis), diabetes, and increases the risk of sudden cardiac death. Intake of trans-unsaturated fatty acids has also been linked to a higher likelihood of ovulatory infertility in women.(3).

The use of trans fats has risen considerably in recent years. This increase is largely due to them being generally less expensive than healthier alternatives and possessing chemical and physical properties that make them well-suited for various processed food products, such as being solid at room temperature(2).

The year 2023 had been declared as the year of becoming "trans fat free". It is a mandate by WHO to eliminate industrial trans fat by :

Limiting trans fats to 2 grams per 100gms of total fats in all foods

Ban the production or use of partially hydrogenated oils as an ingredient in all foods (2).

REPLACE initiative by WHO INCLUDES

"RE- **RE**view dietary sources of industrially-produced trans fat

P- **P**romote the replacement of industrially-produced trans fat with healthier fats and oils

L- **L**egislate or enact regulatory actions to eliminate industrially-produced trans fat

A- **A**ssess and monitor trans fat content in the food supply and changes in trans fat consumption

C- **C**reate awareness of the negative health impact of trans fat among policy-makers, producers, suppliers, and the public

E- **E**nforce compliance with policies and regulations"(4)

Despite existing public health initiatives, there remain substantial gaps in knowledge concerning the health hazards associated with dietary trans fats, as well as the levels of trans fats present in commonly consumed fried foods across both urban and rural areas of the district. Hence, this study was conducted with an aim to study the current awareness on trans fats and to improve awareness on health hazards caused by trans fats via infographics. The estimation of trans fats levels in commonly consumed fried food items have been done.

Objectives:

Primary Objectives:

- To study the knowledge, attitude and consumption behaviour of trans-fats among residents of pali city
- To estimate the amount of trans fats in top 5 commonly consumed fried foods in the district.

Secondary Objectives:

- To share infographics on harmful effects of trans fats among participants and to encourage reading of nutritional profiles of packaged foods.

MATERIAL & METHODS

Study design: Community based observational cross-sectional study

Study setting: District Hospital/ Urban Health Training Centre (UHTC) and Rural Health training centre (RHTC) of Government Medical College Pali

Study participants: Participants from residences, commercial complexes and local food outlets in the catchment area of District Hospital/ UHTC and RHTC training centres were included in the study.

Inclusion criteria:

- Should be above 18 years of age
- Should possess a smartphone to view the infographics
- Gave consent to participate in the study

Exclusion criteria: Not willing to participate in the study.

Study period: 12 months

Sample size: The required sample size was calculated using the formula $n= Z^2 *p(1-p) /d^2$.

Where Z = 1.96 at 95% Confidence level

P= 50% (assumed prevalence of correct knowledge on dietary trans fats)

d= 5% allowable error.

Substituting the above values in the formula the sample size came out to be 384.

Study sampling procedure: Simple random sampling procedure was followed for selecting the participants among the households, commercial complexes and food outlets within 10 kilo meters of the health centres.

Data collection: Data collection was carried out by the Principal Investigator along with trained volunteers after creating the Android-compatible infographics. A semi-structured Google Forms questionnaire was used to gather information from participants regarding their intake of trans fats. The questionnaire was pilot-tested prior to its final use.

Data on various socio-demographic variables, knowledge, attitude and consumption behaviour about dietary trans fats and packaged food was documented.

The participants were asked about the packaged and fried foods which they commonly consumed. On the basis of response obtained, the top 5 commonly consumed food items were Mirchi Bada, Samosa, Kachori, Jalebi, and Pani Puri. The analysis of trans fat in 5 food items was done at Omega Test House,Jaipur. After the questionnaire was filled, participants were also shown the infographics. Their opinion regarding the infographics was obtained using 5 point likert scale.

Data Analysis: Data was entered and analysed using Epi Info (version 7.2) and MS Excel software (version 16). Proportions for key indicators were obtained regarding knowledge, attitude and consumption behaviour of packaged foods, trans fat content of 5 commonly consumed packaged/street foods was done at a laboratory in Jaipur.

Quality assurance: Data quality was ensured through peer review during the development of the study protocol. The questionnaire was pre-tested among local residents. The Principal Investigator provided thorough training and oversight to the field volunteers. Additionally, approximately 10% of the completed questionnaires were randomly verified by the Principal Investigator.

Human subject protection: Participants were informed about the study and provided with an information sheet for their reference. Written informed consent was obtained from them in the local language. The project received approval from the Institutional Ethics Committee of Government Medical College Pali.

RESULTS

A total of 409 individuals participated in the study. The average age of the participants was 30.64 years, with a standard deviation of 11.63.

The majority of study participants were between 21 and 40 years of age. Most of them were female (71.4%, 292), with 54.8% (224) engaged in household work. A large proportion (76.5%, 313) were married. In terms of education, 27.1% (111) had completed up to the 12th grade, followed by 18.3% who had studied up to middle or high school. The majority of the participants (91.2%, 373) were identified as Hindus. (Table 1)

Table1: Showing the socio-demographic characteristics of study participants.

Age	Frequency	Percent
< 20 years	14	3.4
21-40 years	340	83.1
41-60 years	38	9.3
61-80 years	17	4.1
Sex		
Female	292	71.4
Male	117	28.6
Occupation		
Businessmen	26	6.9
Government employee	9	2.2
Housewife	224	54.8
Non-government employee	12	2.9
Self-employed	46	11.2
Student	74	18.1
Unemployed	16	3.9
Education		
Illiterate	34	8.3
Can read and write name only	11	2.7
Primary (till class 5)	58	14.2
Middle and High School (from 6th till class 10)	75	18.3
Higher secondary (till class 12 or equivalent)	111	27.1
Graduate and above	120	29
Marital Status		
Married	313	76.5
Single (never married)	83	20.3
Widow	9	2.2
Widower	4	1.0
Religion		
Hindu	373	91.2
Muslim	36	8.8
Household		
Rural	226	55.3
Urban	183	44.7
Total	409	100

When participants were asked about trans fats, 70.66% (289) reported being unaware of what trans fats are, and 68.9% (282) did not know the difference between natural and artificial trans fats. Only 29.6% (121) recognized that industrially produced trans fats are harmful to health. 50% of the participants were unaware of partially hydrogenated vegetable oils. Regarding food label awareness, 46% (188) stated they never checked labels for trans fat content on packaged food items, while 47.4% (194) mentioned they only sometimes read them. Majority 83.4% (341), reported consuming packaged or fried street foods, with 40.2% (137) consuming them at least once a week. More than half of the participants (57.7%) were unaware of the WHO's REPLACE initiative. Furthermore, 93.9% did not know about the trans fat limit set in India, and 72.4% (296) had never seen the FSSAI trans fat logo on packaged products. 94.9% (388) of them were unaware of any

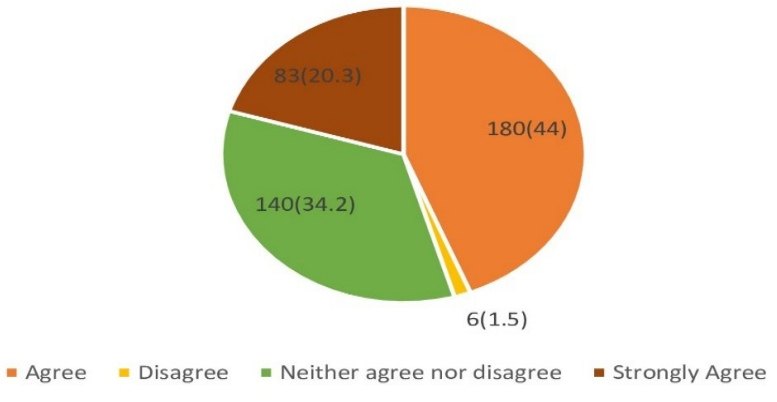
government efforts aimed at reducing trans fat consumption by public.

Despite the lack of awareness, 77% (315) expressed a willingness to reduce their trans fat intake, and 92.7% (379) agreed to adopt dietary changes to do so. When asked about countries that have banned trans fats, 94.4% (386) indicated they had no knowledge of such bans. (Table 2)

Table2: Showing the knowledge, attitude and consumption behaviour regarding trans fat.

	Frequency	Percentage
Do you know what are trans fats		
Yes	120	29.34
No	289	70.66
Is there any difference between natural and artificial/industrial produced trans fats.		
Yes	75	18.3
No	52	12.7
Don't Know	282	68.9
Are industrially produced trans-fat hazardous		
Yes	121	29.6
No	33	8.1
Don't Know	255	62.2
Do you know about partially hydrogenated vegetable oil		
Yes	105	25.7
No	107	26.2
Don't Know	197	50.1
Do you read the food labels for trans-fats content on packaged products		
Always	9	2.2
Mostly	18	4.4
Never	188	46.0
Sometimes	194	47.4
Do you consume packaged food items/ fried street foods		
Yes	341	83.4
No	68	16.6
If yes, how often do you consume		
1time/week	137	40.2
2times/week	82	24.0
3times/week	53	15.5
4 times/week	28	8.2
Non-response	41	12.1
Do you know about the REPLACE initiative by WHO		
Yes	17	4.2
No	236	57.7
Don't Know	156	38.1
Presently what is the limit of trans fat in India		
1 gram per 100gms of total fats	10	2.4
2grams per 100gms of total fats	12	2.9
3gram per 100gms of total fats	3	0.7
Don't Know	384	93.9
Have you seen the FSSAI trans-fat logo on packaged food items		
No	296	72.4
Yes	113	27.6
What is the government doing to reduce trans fats consumption by public		
Don't know	388	94.9
Know	21	5.1
Do you want to reduce trans fats consumption		
Don't know	56	13.6
No	38	9.3
Yes	315	77.0
Will you follow the changes in diet to reduce trans fats consumption		
Yes	379	92.7
No	30	7.3
Do you know of any countries who have banned transfats		
Yes	23	5.6
No	386	94.4

Figure1: Opinion regarding infographic content about trans fat



Once the questionnaire was completed, a PowerPoint presentation containing infographic content was shown to the study participants, and their feedback on the infographics was collected. The results showed that 83(20.3%) participants strongly agreed, 180(44%) participants agreed, and

140 (34.2%) participants neither agreed nor disagreed with the infographic content(Figure1)

The five most commonly consumed food items, identified through the questionnaire, were Mirchi Bada, Samosa, Kachori, Jalebi, and Pani Puri. The fatty acid profiles of these food items, along with the oils used in their preparation, was analyzed at the NABL-accredited laboratory. Proper packaging and labelling protocols were followed during the transportation of samples to the laboratory. Fat extraction and analysis were carried out using the AOAC Official Method 996.06, employing the Hydraulic Extraction Gas Chromatographic Method. The maximum trans fat levels per 100gm were obtained in used oil(1.77gm), followed by Kachori(0.28gm), mirchi bada(0.16gm) and samosa(0.09gm). The value of trans fat was less than 0.01gm per 100gm in pani puri and jalebi(Table 3)

Table 3: Showing the fatty acid profile of commonly consumed products.

Food item	Fatty acid Profile			
	Saturated Fatty acid per 100gm	Mono Unsaturated Fatty acid per 100gm	Poly Unsaturated Fatty acid per 100gm	Trans Fatty acid per 100gm
Mirchi bada	1.34gm	2.67gm	2.01gm	0.16gm
Samosa	2.87	1.87	1.21	0.09
Kachori	10.21	8.04	1.28	0.28
Jalebi	5.02	0.28	0.18	BLQ(LOQ -0.01
Pani puri	5.20	2.64	5.67	BLQ(LOQ -0.01
Used frying oil	9.54	67.25	22.52	1.77

DISCUSSION

A total of 409 participants were enrolled for the study. Majority of the participants belonged to 21-40 years i.e.340(83.1).A study conducted among college students in Indore also had the participants in the 18-22 yrs of age(5). In another study conducted by Singh et al in Punjab, age of the participants varied between 20-34 yrs(6). In a study conducted in Kashmir among 228 college students,207(90) of the students belonged to 19-21 yrs of age (7).

When asked about the awareness regarding transfat 289(70.66) participants were not knowing about trans fat in our study. Similar findings were reported by studies conducted by Banseria et al and Singh et al in Punjab in 2022.A study conducted by Khanna et al reported that 92% of the participants did not know about trans fat(8) Contrary to this study conducted by Jastin et al in NewYork reported that 92% of the participants had heard about trans fat conducted among urban college students(9).

In our study 188(46) never read the food labels for trans fat content on packaged foods, study conducted by Jastin et al among 222 urban commute college students reported that 38% of the participants never check the trans fat information on food labels while consuming. In another study conducted by Kamel et al in Saudi Arabia 79.5% of the participants did not read food labels(10). In another study conducted in Jordan among 417 college students 63 (15) of the students never read the food labels and 70% of the students were females(11).In our study also 292(71.4) of the study participants were females. Another study conducted in Kashmir also reported that 29(12.7) of the participants never read food labels(6).

Majority of the studies on transfats were conducted among college students, targeting mostly the adolescent age group. We conducted a community based cross-sectional study to understand the knowledge which is prevalent in the community, as well as to orient them about the harmful effects of trans fat, so that they can further educate others .

The selected food items were analyzed for their fatty acid composition, including saturated, monounsaturated, polyunsaturated, and trans-fatty acids. The analysis was performed using the AOAC 20th edition (2016), Method No. 996.06(12). The trans-fat content in Mirchi Bada was determined to be 0.16 g per 100 g.

A study conducted by Gupta et al in North India in 2012 also estimated the trans fat content in Samosa, Kachori and in sampled oil. The results were expressed as a percentage of total fatty acids. The maximum trans fat as a percentage of total fatty acids was present in Kachori(11.67%),followed by samosa(10.35%) in this study(13).

CONCLUSION

In our study, among the 409 participants enrolled, about 70% were unaware of trans fats, and 68.9% did not know the difference between natural and artificial trans fats. Packaged foods were consumed at least once a week by 83.4% of the participants. Furthermore, 57.7% had no knowledge of the WHO's REPLACE initiative, and 94% were unaware of the trans fat limit set in India. 72.4% had not seen the FSSAI trans fat logo on packaged food items. 77% expressed a desire to reduce their trans fat consumption, and majority (92%) were willing to

make dietary changes to do so. After being shown infographics post-questionnaire, 20% strongly agreed and 44% agreed with the information presented. Among the common food items Kachori, mirchi bada, samosa,jalebi and pani puri, the maximum trans fats levels were detected in the oil used for frying kachori,mirchi bada and samosa. There is a clear need to increase public awareness regarding trans fats, especially in light of the rising burden of non-communicable diseases.

Recommendation

Inspite of the various initiatives by the government the public is still unaware about the information depicted in food labels on the food items when they buy them.. The focus of spreading awareness on trans fats should be a continuous effort across all ages as done by infographics in this community-based study to raise awareness among the general population.

Limitation of the Study

This study was conducted on a small scale, and to create a broader impact, more such community-based health education initiatives using infographics can be scaled up across districts of Pali with high consumption of fried street foods .Although trans fat levels were assessed, the number of food items analyzed was limited due to financial constraints.

Relevance of the Study

The consumption of trans fat has increased in recent years and people are still not aware about the harmful effects of trans fat. Without increased awareness, it is unlikely that people will come to know about these facts. The lack of awareness has led to increased consumption of trans fat and also the habit of not reading food labels.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

The authors declare no conflicts of interests.

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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