Dietary Intakes of Trans Fatty Acids in a Sample of Egyptian Children aged 2-12 years

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ABSTRACT

Trans Fatty acids (TFA) have been used in food manufacturing as they increase the shelf life of products. Studies show that industrial TFA is associated with the risk of heart disease, increased BMI, and waist circumference. WHO recommends less than 1% of energy intake from TFA in adults and children. ***Aim:*** *to determine the type, sources, and amount of TFA consumed by Egyptian children. Also, estimate the TFA intake as a percent of total calories per day.* ***Method:*** *A cross-sectional study was conducted among some Egyptian children attending a pediatric outpatient clinic at the National Nutrition Institute in Egypt. The data was collected from January to June 2023. A consecutive sample of 200 children was subjected to Physical examinations, Anthropometric measurements, and Assessments of nutritional intake. Parents filled out a questionnaire about their socioeconomic status.* ***Results:*** *the age was 2-12 years with mean ± SD 7± 3.1 years, the majority was boys 54.4%. The total TFA consumed was industrial TFA 62.6% and the source was mainly fast food 87.3%. The natural TFA intake was from red meat at 57.8%, and cheese at 30.12%. Less than 1% of energy intake was from TFA in 95.5% of the studied children. A significant positive correlation between the intake of natural TFA and the age, weight, and height of studied children $p < 0.05$.* ***Conclusion:*** *Industrial TFA intake is high in the form of fast food and snacks. The government should reinforce nutrition labeling and direct health education to reduce TFA in food.*

Keywords: *Industrial TFA, Natural TFA, Energy Intake.*

Introduction

Trans Fatty acids (TFAs) have long been used in food manufacturing due in part to their melting point at room temperature between saturated and unsaturated fats and increase the shelf life of products (**Islam, et al., *2019).*** It can be produced industrially by the partial hydrogenation of vegetable and fish oils. The main sources of industrial TFA are margarine, commercially baked products such as French fries and onion rings, deep-fried fast foods, packed snack foods, and other prepared products (**Eckel, et al., 2007)**.

Industrial TFA is considered the main source of dietary TFA in many populations as they can be found at home, in restaurants, or the informal sector as street vendors **(WHO, 2015).** On the other hand, natural TFA is ingested by the consumption of meat or dairy products from ruminant animals where small amounts of TFA are produced by microorganisms present in the stomach of ruminant animals, such as cows (**Bauer and Waldrop, 2009)**. Processed foods and oils provide approximately 80% of trans-fats in the diet, compared to 20% that occur naturally in food from animal sources (**Stender et al 2008).**

There was a well-established correlation between the plasma concentration of TFAs and the TFAs intake (**Kwon 2016)**. The epidemiologic and biochemical evidence suggests that excessive trans fats in the diet are a significant risk factor for cardiovascular events as well as a risk factor for cancer and diabetes (***Islam, et al., 2019)***.

The average intake of industrial TFA reported in most studies in adult populations is about 2.5-fold higher than that of natural TFA and there is evidence that industrial TFA, but not natural TFA, is associated with a higher risk of coronary heart disease (**de Souza et al, 2015**). This could be explained by the true effect of the ingestion of industrial TFA but also be the result of lower consumption levels of natural TFA in adults (**de Souza et al, 2015**). It has been estimated that a 2% rise in energy consumption from TFA is linked with a 23% increase in the risk of coronary heart disease (CHD) (**Mozaffarian, et al., 2006)**.

A recent study found an association of increased dietary TFA with increased body mass

index BMI and waist circumference, it's reinforced by experimental documentation that dietary TFA (without excess calories) increases visceral fat in animals (**Golomb, et al., 2021**).

Moreover, many Previous studies have suggested that TFA may play a role in adult obesity (**Thompson et al., 2011)**. Two large American cohort studies found positive associations between total intake of TFA and changes in weight and waist circumference in adults (**Koh-Banerjee et al., 2003); (Field et al., 2007)**. On the other hand, a follow-up study observed a weak inverse association between the natural TFA intake and weight changes in Danish adults (**Hansen et al., 2012**).

Because Trans-fatty acids have been reported to have many health hazards, the World Health Organization WHO recommends consuming less than 1% of total energy intake from TFA in adults and children **(WHO, 2016 & 2003).**

The key factors that influence the healthy growth and development of children are nutrition and a balanced diet, followed by physical activity **(WHO, 2023**). it is important to identify risk factors in childhood to be tracked and can be modified early to prevent future health hazards (**Kelder et al., 1994)**. Intake of Trans fatty acid (TFA) has been identified in adults and the health hazards were reported in previous studies, but data on preschool children are scarce. The researchers conducted the current study to determine the type, sources, and amount in grams of trans fatty acids consumed by Egyptian children aged 2 – 12 years. Also, determine the associated socio-demographic and lifestyle factors. Furthermore, to estimate the trans fatty acids intake as a percent of total calories per day.

Methods

Study design

The current study is an analytical cross-sectional study design.

Study setting and population

The study was conducted among some Egyptian children aged 2 – 12 years. The sample was 200 children selected by consecutive convenient sampling techniques **Cochran (1963); Flower (1993); Lohr, (1999)** from children attending the pediatric clinic for medical advice at the National

Nutrition Institute in Egypt and who met the inclusion and exclusion criteria of the study. The data was collected from January to June 2023. The parents were invited and asked to fill out a questionnaire related to sociodemographic characteristics and the eating habits of their children.

Inclusion criteria:

- children aged 2-12 years.
- The parents' consent to enroll in the study was written consent obtained from the parents before the start of the study.

Exclusion criteria:

The study excluded premature birth, intrauterine growth retardations, children who suffered from chronic systemic diseases e.g., chronic renal, liver diseases, gastrointestinal disease, congenital cardiac diseases, also children with diabetes, cystic fibrosis, chronic bowel diseases, any illnesses affecting the nutrient metabolism, and other conditions that require a fat restriction diet were excluded from the study.

Data collection tools

All the enrolled children in the study were subjected to the following:

1- Physical examinations.

2- Anthropometric measurements: Height, Weight, and Body mass index for age, Z- scores of the infants and young children according to WHO (SDSs) reference values of the age- and sex-specific were assessed. The subjects were asked to take off heavy clothes, shoes, and belts during the anthropometric measurements. A series of repeated three measurements were done, and averages for each child were taken then the data were plotted on reference growth charts of **WHO (1995); de Onis et al., (2007)**.

Weight for age (per kg):

Weight was measured using a platform scale; the scale was standardized by known weight before the study and corrected according to the test. The subject was standing barefoot and wearing light clothes on the center of the platform without touching or leaning on anything. The weight was measured to the nearest 0.1 kg. The weight status was determined according to WHO z-score growth references curves [10,11] and categorized into:

Normal weight ranges from – 2 SD to + 2 SD

Underweight < - 2 SD

Height for age (per cm):

As the child is two years or older, and can walk, the height is measured by using the Raven Minimetre, with direct reading of height with an accuracy of +/- 0.1cm. The child was wearing light clothing and standing barefooted on a flat surface, with feet flat and parallel together and the hair accessories removed. The arms hanged freely on the sides and the heels, back of knees, buttocks, shoulder blades, and back of head were in contact with the wall. The head was held comfortably erect with the outer border of the orbit with the external auditory meatus in the same horizontal plane. The measuring arm was brought down the subject's head with the back firmly against the wall. The red cursor line was giving the accurate height measurement, the height Measured to the nearest 0.1 cm. Heights status was determined according to the WHO z-score of references growth curves **(WHO,1995); (de Onis et al., 2007)** and categorized into:

Normal height ranges from – 2 SD to + 2 SD
Short stature (Stunted) < - 2 SD

Weight for Height for age:

The children were classified according to WHO z-score growth references curves into:
Normal weight for height ranges from – 2 SD to + 2SD
Wasting < - 2 SD

Body Mass Index (BMI) for age (kg/ m2):

BMI was calculated by the equation of the weight (in kg) divided by the square of height (in meters), then the result of the equation of each female child put on the age and sex-specific BMI Z-score growth curves of the WHO [10], classified as:

Normal BMI range -2 to + 2 SD
Overweight: BMI > +2 SD
Obese: BMI > +3 SD
Underweight: BMI <-2 SD

3- Assessments of nutritional intakes performed by using 24hrs dietary recalls of three separate days, and a Food Frequency Questionnaire of some selected food items:

The methods were used for measuring the food consumption of eligible children classified into two major method groups:

The first known as the quantitative daily consumption method, consisted of the 24-hour recalls designed to measure the quantity of foods consumed over a day the twenty-four-hour dietary

recall" method.

The second method included the dietary pattern, and the Food Frequency Questionnaire (FFQ).

-Twenty-four hours dietary recalls (24hrs recalls) method:

By this method the 24-hour dietary recalls of the quantity of foods consumed on three separate days including (the usual day, holiday, and shopping day) over the last week. These data were taken from every child's mother to calculate the average quantities of daily food consumed over a day period from the previous three separate days.

The trans fatty acids were calculated based on daily 24-hour recall per child. The trans fatty acids nutrient value database was compiled from a variety of sources, mainly obtained from food composition tables from the United States Department of Agriculture (USDA) (**Field et al., 2007)**, Standard Reference database tables, FDA, and other sources including nutrition facts labels, academic research, and manufactures data (**Hansen et al., 2012); (WHO, 2016)**.

The quantities of foods estimated with detailed of all food and beverages consumed in household measures and grams, which achieved through the use of a pre-prepared list of weights of commonly used household measures in Egypt developed by the National Nutrition Institute. The compiled food composition tables (FCT) of the National Nutrition Institute 2006 were used to determine the daily energy and nutrient intakes of the food consumed by every child **(NNI, 2006).** The analysis of grams of food and beverages to energy and nutrients was carried out by computer with a certain program.

-Dietary pattern (Food Frequency Questionnaire):

- The Food Frequency Questionnaire method (FFQ) was used to give qualitative descriptive information on the dietary patterns of children which are recruited in the study by asking their parents how many times different food items were consumed by the studied children aged 2 -12 years. The responses were daily (less than 3 or more than 3 times), weekly (less than 3 or more than 3 times), and monthly basis or never response. FFQ included the appropriate foods to study children

aged 2-12 years and was further validated with three separate 24-hour recalls. To estimate the main food sources of total, industrial, and natural trans fatty acids (TFA), the study grouped the consumed foods as follows: fast food, milk, processed baked goods, red meat, processed meat, chocolate, cheese, sweets, butter, and others. The contributions of each food or food group to total, industrial, and natural TFA intake were added, and results were presented graphically.

4- All parents were asked to fill out a questionnaire to provide information about the socioeconomic state of the family. We use 3 domains in the questionnaire (education, family, and economic domains) to study the association between them and the intake of total, industrial, and natural TFA as they can influence family choices and their eating habits (**El-Gilany et al, 2012); (Fahmy, et al, 2015)** The 3 domains are:

- The Education domain consists of the education of the father and mother illiterate/ primary education/preparatory/secondary / university graduate.
- The Economic domain consists of the occupation of the father and mother if working/not working, and the family economic state if the income just covers the routine expenses (low)/ covers the routine expenses and emergencies (middle)/ can save (high).
- The family domain consists of the number of Family members, number of siblings, and residence urban/rural). Also, the questionnaire contains data about family and child eating habits and meal preparation methods.

5- Medical records containing the complete three separate 24-hour recalls of daily intake and Food Frequency Questionnaire of the children were obtained.

Statistical analysis

The completeness and logical consistency of the collected questionnaires were revised. The data were pre-coded and entered into Microsoft Office Excel program for Windows, 365. Data were transferred to the Statistical Package for the Social Sciences version 21 (SPSS-V 21) for data analysis.

Ethical approval

Confidentiality was guaranteed in handling the

database and questionnaire forms according to the revised Helsinki Deceleration of Biomedical Ethics. Ethical approval of the research was obtained from the research ethics committee of the National Nutritional Institute and the General Organization for Teaching Hospitals and Institutes.

Results

The studied children aged 2 – 12 years with a mean ± SD 7± 3.1 years. Boys accounted for more than half of the studied children (54.4%).

Figure 1 shows that more than half of the total TFA consumed by studied children came from industrial TFA (62.6%).

Figure 2 shows that the majority 95.5% of the studied children obtained less than 1% of their energy intake from TFA.

Table 1 shows that the mean daily intake for total TFA was 4.25±3.36 g/day representing 2.62% of total calorie intake, and the corresponding mean intakes of industrial and natural TFA were 2.66±3.17 g/day with 1.5% calorie intakes and 1.59±1.22 g/day with 1.01% of calorie intakes respectively.

Figure 3 shows that more than half of the total TFA intake of studied children was fast food (54.64%) and red meats (21.64%) followed by cheese (11.27%) and the least was from sweets (0.05%).

Figure 4 shows that the major source of industrial TFA intake was fast food (87.3%) followed by processed baked goods (9.1%).

Figure 5 shows that more than half of natural TFA intakes were red meat (57.8%), followed by cheese (30.12%).

Table (2) Shows a statistically significant positive correlation between the intake of natural TFA and the age, weight, and height among the studied children ($p < 0.05$). No significant correlation was found between intake of total and industrial TFA and the age, height, weight, and BMI of the studied children.

Figure (6) The Scatter plot showing a significant positive correlation between the age of the studied children and natural trans fats intake ($P < 0.0001$, $r = 0.25$).

Figure (7) The Scatter plot showing a significant positive correlation between the weight of the studied children and natural TFA intake ($P = 0.001$, $r = 0.23$).

Figure 8 scatter plot graph shows a significant positive correlation between intake of natural TFA and height of the

studied children (P<0.001, r = 0.23).

Table 3 shows a significant difference in TFA intake was found only with natural (TFA) to three different age groups of the studied children.

Tables 4,5 & 6 show no significant associations between the parent's and child's characteristics and the intake of total TFA, industrial TFA, and natural TFA.

DISCUSSION

The present study found that the enrolled children consumed (62.5%) of the total dietary trans fatty acids (TFA) from industrial origin and the majority (95.5%) of the participated children in the study obtained less than 1% of their calorie intake per day from trans fatty acids (TFA) and goes with the WHO recommendation **(WHO 2016 & 2023).**

The current results are opposed to those reported by a Spanish study in children aged 4-5 years as they found the TFA intake in half of their studied population (52 %) was of natural origin, and only about (10%) of the children of the study obtained more than 1% of their energy intake from TFA (**Scholz A. et al., 2026**). In contrast, in a Canadian study with 100 children aged 5 to 6 years, (12%) of the children exceeded 1% of the energy intake from TFA (**Mulder et al., 2013)**.

In this study, the mean percentage of energy intake provided by total TFA was (2.62%) while it was (0.71%) & (0.77%) in the Spanish and Canadian studies respectively (**Scholz et al., 2026**) (**Mulder et al., 2013)**.

In a survey conducted in a Chinese population with participants aged 3 years and older, the reported intake of total TFA among children from 3 to 6 years was much lower than those in the present study. The main daily TFA intake was 0.49 g/day which corresponded to 0.34 % of their total energy intake and less than 0.42% of the participants surpassed the limits recommended by the WHO (**Liu 2015)**.

TFA was added to processed foods to improve shelf-life, stability, and palatability at a lower cost (21). In this study, the main food sources of the total TFA intake among children were fast food (54.64%), red meat (21.6%) followed by cheese (11.27%), and regarding the industrial TFA intake, we found that fast food

(87.3%) is the main source followed by processed baked goods (9.1%). This increased intake of industrial TFA may be due to its attractive presentation and high palatability (bakery, industrial products, fast food, hamburgers, French fries, and appetizers or snacks).

These results were similar to those reported by the Spanish study regarding the industrial TFA intake as we observed that the main sources were fast food (44.9% vs 25%), and processed baked goods (18.3% vs 20%). Also, our results were similar to those reported by a Canadian study, regarding industrial TFA intake as the main sources were fast food and processed baked goods (**Scholz et al., 2026**) (**Mulder et al., 2013)**. On the other hand, natural TFA intake in these studied children was red meat (57.8 %) followed by cheese (30.12%) then milk (3.5%), while in the Spanish study, they found that milk was the main source of natural TFA (37%) followed by red meat (13%) (**Scholz et al., 2026)**.

The current study found a significant correlation between age, weight, height, and the intake of natural TFA among the studied children ($p < 0.05$) with no significant correlation with BMI. Furthermore, no significant correlation between total and industrial TFA intake and the age and anthropometry Z score of the studied group. A prospective study in Colombia carried out on children 5-12 years did not find an association between serum TFAs and weight gain (**Baylin et al., 2015)**. Also, the existing study found a significant difference in natural TFA intake $p < 0.001$ between 3 age groups of the studied children, in which natural TFA intake was higher in children >10 years the mean daily intake was 2.11 ± 1.26 g/day and energy intake E% was 1.25± 0.76 % of total natural TFA energy intake. This finding was consistent with a study carried out in China in which they found that adolescents were exposed to a higher proportion of TFAs due to the abundant consumption of dairy products which had become an important source of dietary TFA. They found that TFA intake accounted for 0.34%, 0.30%, 0.32%, and 0.29% of the total energy intake in the studied age groups 3-6, 7-12, 13-17, and ≥ 18 years, respectively (**Liu et al., 2015**). This is the opposite of the results in a Spanish study of preschool children in

which natural TFA intake was lower by 0.71 g/day (**Scholz et al., 2026)**.

It would not be possible to eliminate trans-fat from the average diet. However, it is important to significantly reduce the consumption of trans fat by eliminating the use of hydrogenated oils in food preparation and consuming fewer processed foods. Altering the diet to consume lower levels of trans fat could reduce the risk of diet-related health conditions, such as hypercholesterolemia and cardiovascular disease. A study carried out in 2009 showed that a higher coronary heart disease CHD risk is related to TFA from industrial sources rather than low levels of ruminant TFA (**Mozaffarian et al., 2009**).

This study found no significant relation between TFA intake (total, industrial, ruminant) and the sociodemographic characteristics of the parents of the studied children, there was no role of the economic condition of the family in choosing the type of food. These results were similar to the study conducted in the UK among adults in which there was no significant differences were found regarding the sociodemographic data (**Hutchinson, et al., 2018**).

On the other hand, A study was conducted to investigate the socio-economic and food consumption characteristics of high TFA consumers in the Netherlands and the UK among adults, in which they found that females were more TFA consumers in the Netherlands, and in the UK more consumers were in the Midlands and had a more ruminant-based TFA intake profile (**Rippin et al., 20017**).

STUDY LIMITATIONS

The estimates of TFA intakes relied on the children's food intakes reported by their parents using an FFQ and 24-hour recalls which were tested for repeatability and validity for a variety of foods and nutrients, including total TFA intake against three 24-hour recalls but not for industrial and natural TFA intakes. Also, the level of plasma TFAs was unavailable, which could help to illustrate the metabolic processes and their harmful effects on health.

Despite these limitations, the current study still could serve as a popular proxy for the consumption of TFAs, as our research assessed TFA intake in the studied Egyptian children and

differentiated between industrial and natural sources. Additionally, it gives useful information on TFA intake and the main food sources, which may help revise current food-related legislation and it could aid in the development of dietary guidelines to limit TFA consumption.

CONCLUSION:

The present study shows that the industrial TFA intake is high in a relevant proportion of children in Egypt, the present data confirm that food such as fast food, snacks, processed products, and prepared meals are the main sources of TFA which might contribute to negative health effects and obesity. Most of the participating children in the study obtained less than 1% of their energy intake per day from trans fatty acids, this agrees with the WHO recommendation. Also, there is a significant relation between TFA intake with the age, weight, and height of the participating children.

RECOMMENDATIONS:

The current intake of TFA among studied children did not appear to be a major health concern as the threshold of TFA intake as the percentage of total energy is recommended by the WHO. However, most of TFA were derived from industrially processed foods, therefore the government should reinforce nutrition labeling and direct health education to the food producers to further reduce TFA in food and to provide scientific instruction for consumers to make sound choices. Moreover, Parents should be aware of the main sources of TFA to reduce the total TFA intake of them and their children.

Further research is needed to investigate the specific effects of natural and industrial TFA in the pathogenesis of diseases. A prospective design and use of repeated anthropometric measures can allow us to explore the relation between serum TFAs levels and changes in anthropometric measures.

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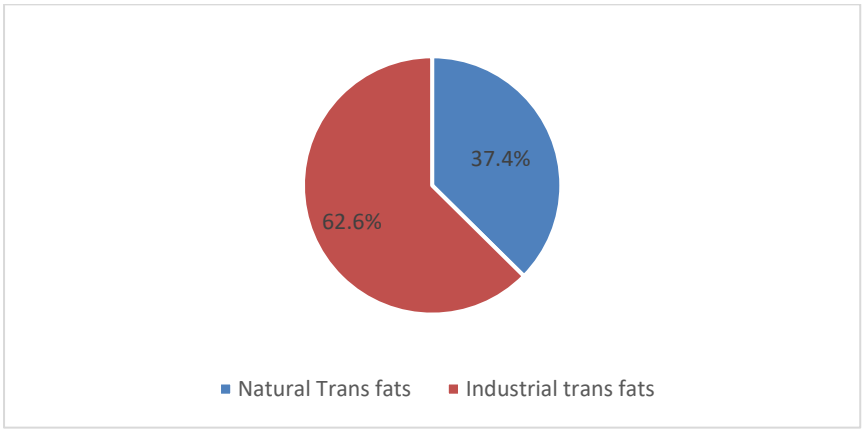

Figure (1): Percent of TFA consumed by studied children in grams.

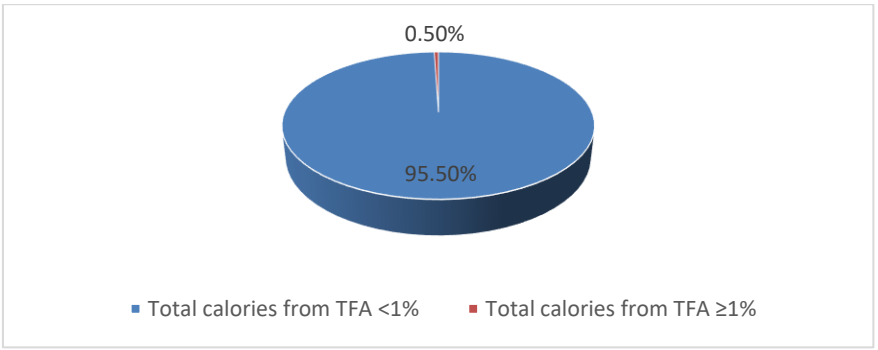

Figure (2): Percent of total calories intake

Table (1): Daily Intake of total, industrial, and natural trans fatty acids (TFA) in grams among the enrolled children.

	Total TFA intake		Industrial TFA intake		Natural TFA intake	
	g/day	Energy % from total TFA	g/day	Energy % from industrial TFA	g/day	Energy% from Natural TFA
Mean	4.25	2.62	2.66	1.5	1.59	1.01
SD	3.36	1.77	3.17	1.1	1.22	0.72
P10	0.73	0.625	0.00	0.5	0.2	0.16
P25	1.57	1.23	0.00	0.7	0.72	0.48
P50	3.7	2.25	1.25	1.1	1.21	0.91
P75	6.46	3.66	3.87	2.2	2.31	1.47
P90	8.38	4.95	7.06	2.9	3.48	2.02

-SD: standard deviation. -P: percentile of the TFA intake.

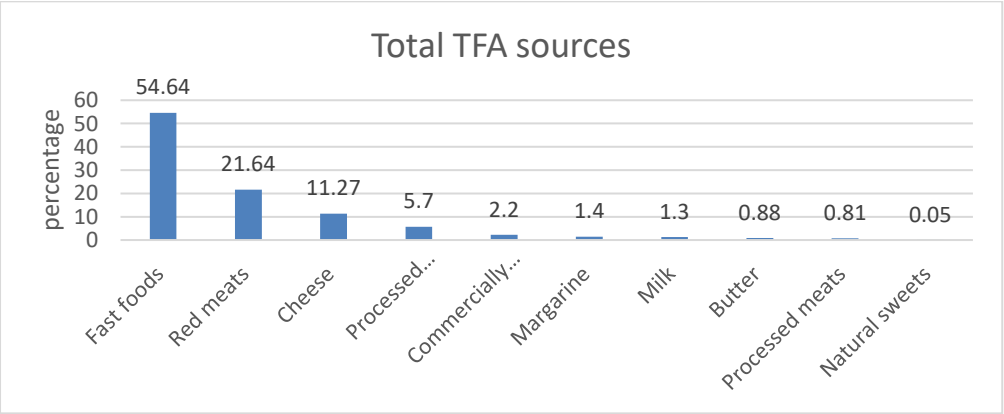

Figure (3): *Main food sources of total trans fatty acids (TFA)intake by studied children (n=200)*

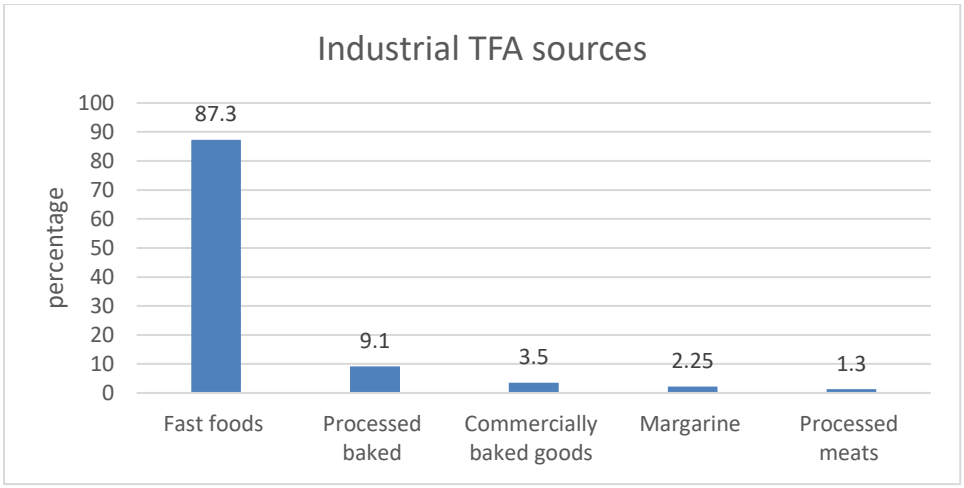

Figure (4): Main food sources of the industrial trans fatty acids intake (TFA) of the studied children (n=200).

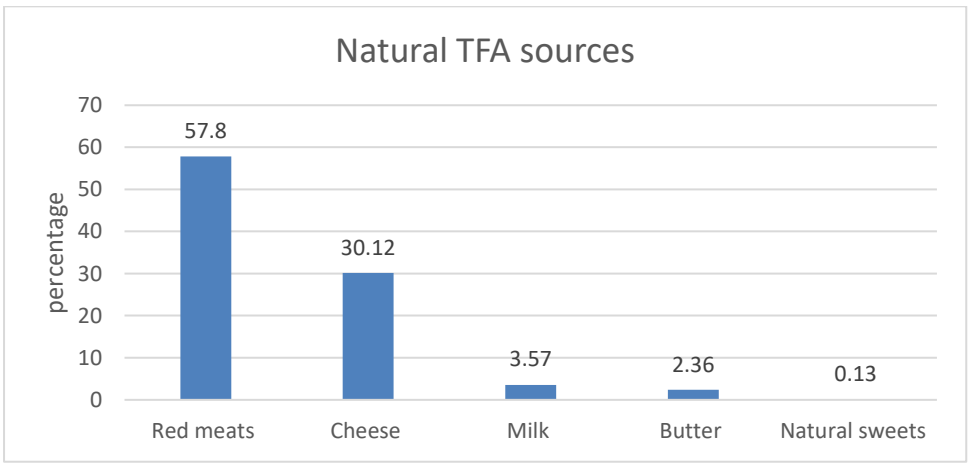

Figure (5): *Main food sources of the Natural trans fatty acids intake (TFA) of the studied children (n=200).*

Table (2): Correlation of age and anthropometry Z score with intake of the total TFA, industrial TFA, and natural TFA in grams.

	Total TFA		Industrial TFA		Natural TFA	
	r	p	r	P	r	P
Age	0.051	0.470	-0.045	0.529	0.257	**<0.0001**
Height	0.026	0.715	-0.063	0.373	0.235	**0.001**
Weight	0.006	0.931	-0.084	0.234	0.235	**0.001**
BMI	-0.034	0.630	-0.064	0.367	0.072	**0.311**

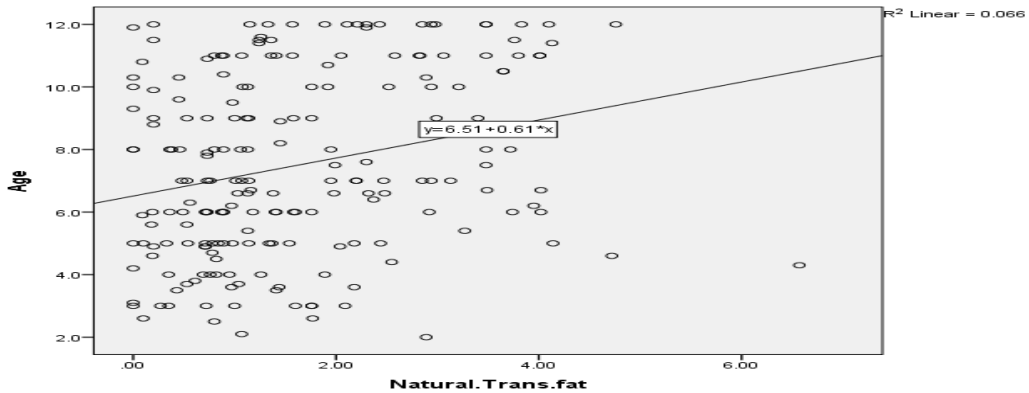

Figure (6): correlation between Natural TFA intake and the age of the studied children (n=200).

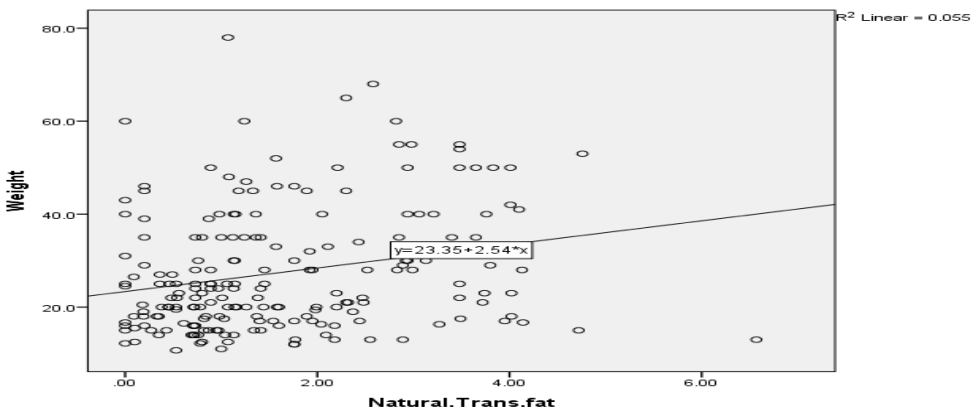

Figure (7): correlation between Natural TFA intake and weight of the studied children (n=200).

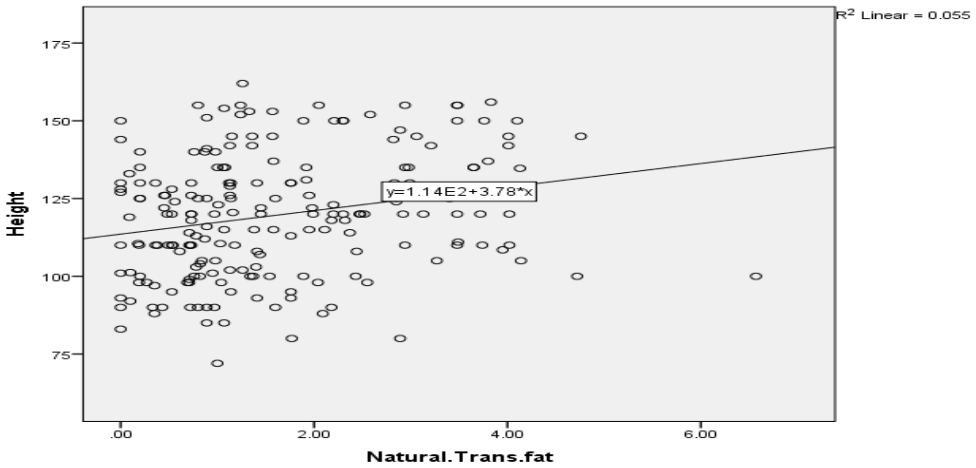

Figure (8): Correlation between Natural TFA intake and the height of the studied children (n=200).

Table (3): Mean and SD of total TFA, industrial TFA, and natural TFA intake regarding different age groups of the studied Egyptian children aged 2-12 years (n=200).

Type of TFA	Mean SD	2 – 5 y (n=41)	5 – 10 y (n=100)	>10 y (n=59)	*P*-value*
Total TFA (g/day)	**Mean**	4.19	4.11	4.52	0.446
	SD	4.23	2.93	3.39	
Total TFA (E%)	**Mean**	2.62	2.63	2.59	0.967
	SD	1.96	1.78	1.63	
industrial TFA (g/day)	**Mean**	2.96	2.68	2.41	0.355
	SD	4.08	2.74	3.18	
Industrial TFA (E%)	**Mean**	1.74	1.70	1.35	0.298
	SD	2.02	1.79	1.66	
Natural TFA (g/day)	**Mean**	1.23	1.42	2.11	**0.0001**
	SD	1.25	1.09	1.26	
Natural TFA (E%)	**Mean**	0.88	0.93	1.25	**0.006**
	SD	0.73	0.67	0.76	

**: Kruskal Wallis test.*

Table (4): Association between parental and child characteristics and the intake of Total (TFA) among Egyptian children aged 2-12 years.

Parent and child characteristics	Total TFA		
	B	**Odds ratio**	**95% CI**
Economic state			
Low	-0.847	0.429	0.1 – 4.4
Middle	-0.405	0.667	0.1 – 5.6
High	Ref	ref	ref
Father education			
Illiterate	19.913	4.448	0.0 – 0.9
Primary	0.320	1.377	0.2 – 12.5
Preparatory	-0.037	0.964	0.2 – 5.1
Secondary	0.415	1.514	0.7 – 3.3
University	Ref	ref	ref
Mother education			
Illiterate	19.817	4.04	0.0 – 0.8
Primary	0.811	2.25	0.3 – 13.1
Preparatory	-0.182	0.83	0.2 – 3.4
Secondary	0.075	1.1	0.5 – 2.3
University	Ref	ref	ref
Father Occupation			
Work	Ref	Ref	Ref
Not work	0.310	0.777	0.2 – 11.7
Mother Occupation			
Work	Ref	Re	Ref
Not work	0.546	1.726	0.8 – 3.6
T.V meals			
Yes	0.363	1.438	
No	Ref	ref	0.7 – 3.1
Sport practice			
Yes	0.253	1.288	0.579 – 2.864
No	Ref	ref	ref
Gender			
Male	Ref	Ref	Ref
Female	0.039	1.039	0.5 – 2.2
Child age	0.099	1.104	1.0 – 1.3

Table (5): Associations between parental and child characteristics and the intake of Industrial (TFA) among Egyptian children aged 2-12 years.

Parent and child characteristics	Industrial TFA		
	B	**Odds ratio**	**95% CI**
Economic state			
Low	0.693	2.00	0.3 – 12.5
Middle	0.594	1.811	0.4 – 9.3
High	Ref	ref	Ref
Father education			
Illiterate	1.632	5.117	0.3 – 106.2
Primary	0.344	1.410	0.1 – 22.1
Preparatory	2.183	8.872	0.9 – 91.0
Secondary	1.304	3.683	1.3 – 10.2
University	Ref	ref	ref
Mother education			
Illiterate	0.290	1.336	0.1 – 20.1
Primary	-2.106	0.122	0.1 – 1.6
Preparatory	-1.295	0.274	0.1 – 1.7
Secondary	-0.798	0.450	0.2 – 1.4
University	Ref	ref	ref
Father Occupation			
Work	Ref	Ref	Ref
Not work	0.841	2.319	0.5 – 10.7
Mother Occupation			
Work	Ref	Ref	Ref
Not work	0.064	1.066	0.6 – 1.9
T.V meals			
Yes	-0.020	0.980	0.5 – 1.8
No	Ref	ref	ref
Sport practice			
Yes	-0.280	0.756	0.4 – 1.4
No	Ref	ref	ref
Gender			
Male	Ref	Ref	Ref
Female	-0.391	0.676	0.4 – 1.2
Child age	-0.052	0.950	0.9 – 1.1

Table (6): Associations between parental and child characteristics and intake of Natural (TFA) among Egyptian children aged 2-12 years.

Parent and child characteristics	Natural TFA		
	B	**Odds ratio**	**95% CI**
Economic state			
Low	-0.916	0.400	0.1 – 2.2
Middle	-0.771	0.463	0.1 – 2.0
High	Ref	ref	ref
Father education			
Illiterate	0.091	1.095	0.2 – 8.1
Primary	0.091	1.095	0.2 – 5.7
Preparatory	-0.602	0.548	0.1 – 2.3
Secondary	-0.287	0.750	0.4 – 1.4
University	Ref	ref	ref
Mother education			
Illiterate	-0.643	0.526	0.1 – 3.0
Primary	0.897	2.453	0.6 – 10.2
Preparatory	-0.420	0.657	0.2 – 2.2
Secondary	-0.50	0.604	0.3 – 1.1
University	Ref	ref	ref
Father Occupation			
Work	Ref	Ref	Ref
Not work	-0.672	0.511	0.1 – 2.7
Mother Occupation			
Work	Ref	Ref	Ref
Not work	-0.197	0.821	0.5 – 1.5
T.V meals			
Yes	0.028	1.029	0.6 – 1.9
No	Ref	ref	ref
Sport practice			
Yes	0.624	1.867	1.0 – 3.4
No	Ref	ref	ref
Gender			
Male	Ref	Ref	Ref
Female	0.017	1.017	0.6 – 1.8
Child age	0.135	1.145	1.0 – 1.3

التناول الغذائي من الأحماض الدهنية المتحولة في عينة من الأطفال المصريين الذين تتراوح أعمارهم بين 2-12 سنة

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المستخلص العربي

يتم استخدام الأحماض الدهنية المتحولة **(TFA)** في تصنيع الأغذية لأنها تزيد من العمر الافتراضي للمنتجات. تشير الدراسات إلى أن **TFA** الصناعي يرتبط بخطر الإصابة بأمراض القلب التاجية وزيادة مؤشر كتلة الجسم ومحيط الخصر. توصي منظمة الصحة العالمية بتناول أقل من ١% من استهلاك الطاقة من **TFA** لدى البالغين والأطفال. **الهدف من الدراسة:** تحديد نوع ومصادر وكمية الدهون الثلاثية التي يستهلكها الأطفال المصريون. أيضًا تقدير كمية **TFA** كنسبة مئوية من إجمالي السعرات الحرارية يوميًا. أجريت دراسة مقطعية على عينة من الأطفال المصريين الذين يترددون على العيادة الخارجية للأطفال في المعهد القومي للتغذية في مصر. تم جمع البيانات في الفترة من يناير إلى يونيو ٢٠٢٣. وخضعت عينة متتالية مكونة من ٢٠٠ طفل لفحوصات بدنية وقياسات بشرية وتقييمات للمدخول الغذائي. وقام أولياء الأمور بملء استبيان حول وضعهم الاجتماعي والاقتصادي. **النتائج** :كان عمر الأطفال 2-12 سنة بمتوسط ٧ **±** ٣.١سنة وكان أغلب العينة من الأولاد الذكور ٥٤.٤٪، إجمالي **TFA** المستهلك هو ٦٢.٦٪من **TFA** الصناعي. كان مصدر **TFA** الصناعي هو الوجبات السريعة بنسبة ٨٧.٣٪. و تناول **TFA** الطبيعي من اللحوم الحمراء ٥٧.٨%، والجبن ٣٠.١٢%. الاستهلاك اليومي للطاقة من **TFA** أقل من 1% في ٩٥.٥% من الأطفال الذين شملتهم الدراسة. هناك علاقة إيجابية كبيرة بين تناول **TFA** الطبيعي والعمر والوزن والطول للأطفال الذين شملتهم الدراسة **P <0.05**. **الخلاصة :** تناول **TFA** الصناعي مرتفع في شكل وجبات سريعة ووجبات خفيفة. و يجب على الحكومة أن تعزز وضع العلامات الغذائية على اغلفة الاغذية والتثقيف الصحي المباشر للحد من **TFA** في الغذاء.

الكلمات المفتاحية: **TFA** الصناعي، **TFA** الطبيعي، استهلاك الطاقة.