National food policies in the Islamic Republic of Iran aimed at control and prevention of noncommunicable diseases

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Abstract

Background: Diet plays an important role in the risk of noncommunicable diseases. In the Islamic Republic of Iran, national activities were started after release of the World Health Organization's (WHO) action plan on prevention and control of noncommunicable diseases.

Aims: This study describes national food policies implemented by the government in order to reduce noncommunicable diseases in the country in line with WHO action plan.

Methods: Newly adopted food standards and regulations linked to noncommunicable diseases from 2013 to 2018 were reviewed and the maximum permitted levels of salt and trans and saturated fats were compared in the old and new standards. Nutritional traffic light labelling to raise public awareness of healthy diets was evaluated.

Results: Fifteen food standards associated with eight food items that make up a large share of the daily Iranian food basket and three that make up a small share were evaluated. Policies on salt included reduction in maximum permitted percentage in bread, cheese and *doogh* (a fermented drink) to 1%, 3% and 0.8%, respectively. For trans and saturated fats, maximum permitted percentages were set as 2–5% and 30–65% of edible oils and fats, respectively. Nutritional traffic light labelling, which indicates the content of salt, sugar, fat and trans fat in foods, has been mandatory for all foods since 2016.

Conclusions: In view of the polices implemented to reduce the salt and fat/oil content of foods, significant decreases in noncommunicable diseases are expected in coming years in

the country. However, further studies are needed to show the effectiveness of the interventions.

Keywords: diet, nutrition policy, noncommunicable diseases, Iran

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Introduction

Noncommunicable diseases (NCDs) are chronic disorders caused by non-infectious agents. NCDs kill 41 million people annually, which represents 71% of all deaths worldwide *(1)*. Based on World Health Organization (WHO) reports, annual deaths from NCDs are mostly linked to cardiovascular diseases (44%), cancers (22%), respiratory diseases (10%) and diabetes (4%) *(1)*. NCDs are an important health concern in the Islamic Republic of Iran; the annual death rate from NCDs represents about 82% of the total mortality in the country *(2)*. National studies show a 14.5% increase in deaths from NCDs in the past 20 years *(3)*. This is of concern, especially as the population is ageing.

Several factors should be considered when developing and implementing strategies to reduce NCDs. For example, diet, and preparation and consumption of foods vary in different societies and according to demographic, cultural and socioeconomic characteristics *(4,5)*. Therefore, one of the main global challenges in designing strategies to control and manage NCDs in large countries such as the Islamic Republic of Iran is modification of food traditions. Practical recommendations to follow a healthy lifestyle are regularly published by WHO. In 2013, WHO made a global call for a 25% decrease in premature deaths from NCDs in people aged 30–70 years by 2025 *(6)*. Furthermore, Member States of WHO endorsed the 2013–2020 action plan that focuses on four behavioural risk factors for NCDs: unhealthy diet, harmful use of alcohol, insufficient physical activity and tobacco use. The action plan describes 25 indicators classified under nine targets *(3,6)* to help countries develop their national strategies for decreasing NCDs. To respond to this call and the action plan, the Iranian Ministry of Health and Medical Education established the national NCD committee in 2015 with the aim of integrating all decisions and activities on the prevention and control of NCDs at the national level in line with the WHO global call. Because NCD mortality from other causes not included in WHO nine targets is high in the country, four further targets were added to the list by the health ministry.

These targets were: zero trans fatty acids in all manufactured food products, reduced traffic injuries, reduced drug abuse and access to treatment for mental diseases.

Similar to other countries, dietary risk factors are significant contributors to NCDs in the Islamic Republic of Iran, and their assessment and management are fundamental to preventing NCDs *(3,7,8)*. Thus, close collaboration between the public sector, private health associations and the food industry is needed to establish healthy food policies to achieve national and international targets. In the Islamic Republic of Iran, the Food and Drug Administration is responsible for national food safety and, as a member of the national NCD committee, works closely with other key players in food and nutrition fields to improve the effectiveness of food policies and strategies linked to NCDs. Many interventions and factors have important roles in the prevention of NCDs, including food reformulation, labelling, monitoring, and public awareness and marketing *(7)*. For example, socioeconomic factors, such as incentives to choose larger packages through advertisements and price encouragements, may negatively affect dietary patterns *(9)*. To minimize the adverse effects of diet on the prevalence of NCDs in the Islamic Republic of Iran, international guidelines and recommendations on food intake were studied by stakeholders including regulatory experts such as risk managers and academic staff. As a result, the maximum permitted levels of salt and saturated and trans fatty acids in food in the national regulations were modified based on Iranian dietary patterns. These modifications were used for staple foods such as bread, dairy products and oil products. In parallel, to increase consumer awareness and its contribution to preventive mechanisms, a new graphical feature was designed and used on all food packaging – a nutritional traffic light.

In this study, policies and interventions adopted in the Islamic Republic of Iran to decrease NCDs following the WHO action plan were reviewed. As the Islamic Republic of Iran is a pioneer in the region in adopting measures to reduce NCDs, especially for trans fatty acids and nutritional traffic lights, we aimed to share our experiences in NCD control with other countries in the region

Methods

In this study, a comprehensive review was carried out on newly adopted food standards and regulations by the Iranian Food and Drug Administration and the Iran National Standards Organization which addressed the WHO target of a 25% decrease in premature deaths from NCDs by 2025. First, food products associated to NCD policies were identified. Then, all relevant standards and regulations, including newly adopted or modified versions, were extracted from the official websites of the Iranian Food and Drug Administration and Iranian National Standards Organization. Furthermore, the maximum permitted levels of salt, and trans and saturated fats in old and revised standards were compared. The activities of the Iranian Food and Drug Administration to raise public awareness about healthy food consumption were also assessed.

Since one of the nine NCD targets introduced by WHO is salt reduction and several national policies have been put in place to decrease and control daily salt consumption, the population attributable risk of the percentage of the incidence of disease that is due to salt was calculated using the following equation:

Population attributable risk % = $P_e \times (RR - 1)/[P_e \times (RR - 1) + 1]$

where, P_e is the proportion of the population exposed to the risk factor (salt in this case) and RR is the relative risk of the risk factor (salt).

Results

Several interventions such as modifications of existing standards or adoption of new standards have been implemented in the country based on the international recommendations of daily intakes of: < 5 g of salt, < 10% total energy intake from saturated fatty acids and < 1% total energy intake from trans-fats *(10)*. We identified eight food items that make up a large share of the daily Iranian food basket and three that make up a small share. As shown in Table 1, 17 standards were identified for these food products, 15 of which were selected for further assessments after removing duplications.

Interventions on salt

Since 2015, the Iranian Food and Drug Administration has taken action on bread, *doogh* (Iranian fermented drink) and cheese as the major sources of salt intake in the country. No new standards have been developed for these food items. As shown in Table 2, three standards were revised with regard to the permitted level of salt in each food item. The permitted percentage of salt in bread was gradually reduced from 1.8% to 1.0% to adapt consumer taste, a decrease of 44%. With regard to foods that make up a small share of the daily food basket, a new national standard was established and implemented in 2015 on the amount of edible salt in food products such as canned foods, tomato pastes, processed olives, sauces and pickles *(16)*. In addition, salt use was banned in probiotic yoghurts in 2018 *(15)*.

Based on epidemiological data, the relative risks of cardiovascular diseases and stroke associated with salt are 1.14 and 1.23, respectively *(26)*. The population attributable risk of both diseases in the Islamic Republic of Iran before the modified salt standards were implemented was calculated. For the analysis, $P_e = 97.66\%$ was used based on a previous study *(27)*. Therefore, population attributable risk % was 12.03% for cardiovascular disease and 18.34% for stroke before the modified standards.

Interventions on oils

To follow WHO recommendations, a number of restrictions have been imposed on oil products in the Islamic Republic of Iran since 2015. The trans fat level was reduced to 2% and saturated fat level to 30% in final oil products for household use. For frying oils added to food

products in industry and minarine (a cream-like product used in confectionary), higher saturated fat levels were allowed compared with household products (Table 3). Moreover, higher maximum permitted levels of trans and saturated fats were set for shortening because it is directly used in oil industries and makes a negligible contribution to daily food baskets (Table 3).

Annual palm oil imports were restricted in the country in 2014, leading to a drop in imports from 750 000 tons in 2013 to about 465 000 tons in 2017 (unpublished report). Furthermore, import tariffs on palm oil increased substantially from 2–4% in 2013 to 26–40% in 2016 (unpublished report). Production of analogue foods using vegetable oils such as analogue cheese and butter, and addition of palm kernel oil/palm stearin to minarine have been banned since 2015.

Nutritional traffic light

A nutritional traffic light system has been designed using three colours – green, orange and red – to indicate low, medium and high levels of ingredients, respectively (Table 4). Calculation of amounts and assigning the colours for each food was based on the quantities per 100 g of solid foods, 100 mL of liquid foods or the serving size. If the serving size is less than 100 g or 150 mL, the levels under heading of per 100 g/100 mL are used. Otherwise, the levels in the last column (per serving size) must be used. Then, if the product does not match with the last column, the colour is selected by converting the quantity per 100 g or 100 mL and using numbers of other columns *(28)*. As shown in Figure 1, the amounts of a product are calculated and inserted in the food label.

Since early 2016, nutritional traffic light labelling on food packages is mandatory for all imported and domestic foods, except for products that are not chemically processed or formulated, such as vegetables, spices, vinegar, lemon juice, tea, infusions, coffee, honey, dates, flour and barberry.

Discussion

Unhealthy diet is one of the four behavioural risk factors associated with NCDs *(6)*. As people of all ages are more likely to be exposed to this risk factor than the other three (tobacco use, harmful use of alcohol and physical inactivity), food interventions to reduce the intake of certain products to safer levels have been instigated by countries.

Salt evidence

Salt is necessary for normal body function and food preservation. Nonetheless, excessive daily salt intake results in diseases such as high blood pressure, cardiovascular diseases and gastric cancers *(29,30)*. For example, sodium intake of 3480 mg/day, equal to 8.8 g/day of salt, was the main contributor to cardiometabolic diseases, mainly in elderly people, in the United

States of America *(31)*. This intake is similar to the daily intake of salt in the Islamic Republic of Iran in 2016 – 9.52 g *(27)*. Based on the clinical adverse effects, WHO has recommended a maximum salt intake of 5 g/day, which allows normal function of the human body with no adverse effects on health *(32)*. Since the national salt intake in the Islamic Republic of Iran was about twice the WHO recommended level, regulatory authorities brought in new restrictions. Mandatory reformulation of popular foods is the most cost-effective approach to decreasing disease burdens associated to salt *(33–35)*. Therefore, we examined salt content of and regulations on staple foods such as bread, cheese and *doogh*.

The Iranian national survey on average daily consumption of food reported a daily consumption of 310 g of bread, 16 g of cheese and 6 g of *doogh* per capita *(36)*. Based on these data, it is estimated that 2.65 g/day of salt has been removed from the food of every Iranian after the adoption of new interventions in 2017. Therefore, the current salt intake is estimated to be 6.87 g/day. We also showed that 12% of cardiovascular diseases and 18% of strokes could be attributed to high salt intake in 2016 (before the regulations). Therefore, large decreases in these diseases are expected in coming years as a result of the reduction in salt intake through staple foods. It is worth noting that the daily salt intake is still higher than that recommended by WHO and further restrictions through reformulations are not practical because of technical limitations. For example, other than the flavour and preservative roles of salt, addition of salt to dough for bread baking is responsible for texture due to the electrostatic interactions between amino acids and effects on hydration of proteins *(37)*. Therefore, to achieve further reduction in salt intake, consumers' awareness of their salt consumption should be promoted. About 50–60% of daily salt intake is from salt that is directly added to food by the consumer *(38)*, which is currently equal to 3.44–4.12 g/day in the Islamic Republic of Iran.

Oil evidence

WHO recommends that less than 1% and 10% of total dietary energy intake per day should come from trans and saturated fats, respectively *(39)*. Cardiovascular diseases impose heavy financial burdens on governments annually because of productivity losses and health care expenses *(40)*. Other than salt contribution, the high cardiovascular disease rates are possibly due to the consumption of saturated and trans fats *(41,42)*. Trans fats have further hazards as they can induce thrombogenesis and atherogenesis *(41,42)*. Despite previous reports, new findings have shown that ruminant-produced and industrial trans fatty acids adversely change the ratio of low-density lipoprotein cholesterol to high-density lipoprotein cholesterol in the human body *(43)*. However, the adverse effects of industrial fatty acids are greater than those of ruminant isomers in normal diets. This effect possibly occurs because of the presence of bioactive components and nutrients in ruminant foods with trans fats *(43)*. Therefore, lower intake of these two fatty acids or their substitution with *cis* unsaturated fatty acids results in healthier blood lipid profiles *(43)*. Moreover, iso-caloric substitution of saturated fatty acids with *cis* unsaturated fatty acids, particularly polyunsaturated fatty acids, results in lower rates

of cardiovascular diseases and significant decreases in low-density lipoprotein and total cholesterol *(40,44)*. Studies have also shown the negative role of saturated fatty acids in type 2 diabetes as saturated fatty acids from milk and liquid oils increased the overall risk of type 2 diabetes *(45)*.

Previously, the main source of trans isomers for humans included partially hydrogenated oils *(46)*. However, the use of these oils has decreased because of the evidence of their clinical adverse effects *(41,42)*. In the Islamic Republic of Iran, similar to other countries, restrictions on the production of partially hydrogenated oils have led to further use of palm oil because of its cost–effectiveness. However, high levels of saturated fatty acids, such as palmitic acid in palm oil and the known carcinogenicity of monochloropropane diol esters which is mainly formed in palm oil during the refining processes *(47)*, were important health concerns. Therefore, the Iranian Food and Drug Administration aimed to decrease saturation levels of fats by requiring industries to use other vegetable oils. The main strategy was setting a maximum permitted saturation in popular household frying oils which previously was not limited, and similar policies were adopted for industrial frying oils. As a result, addition of palm oil to foods was restricted in national food industries and people's exposures to the hazardous compounds decreased to safe levels. Today, Iranian oil industries use various oil fractions to produce food products under the modified regulations. For example, they use emulsifiers in the mixture of unsaturated vegetable oils with small portions of fully hydrogenated oils to prepare healthier semisolid formulations compared with partially hydrogenated oils. These mixtures consist of about 70% common vegetable oils such as canola and sunflower, up to 25% of palm olein and a maximum 5% of fully hydrogenated oils. Therefore, recent formulations contain higher unsaturation rates and reduced levels of trans and saturated fatty acids compared with earlier formulations.

Nutritional traffic light

According to the Codex Alimentarius, "labeling includes any written, printed or graphic matter that is present on the label, accompanies the food or is displayed near the food including that for the purpose of promoting its sale or disposal" *(48)*. To minimize the negative contribution of overweight and obesity to NCDs, simple policies to inform consumers, including nutritional labelling, were introduced for preventive purposes in the Islamic Republic of Iran. Nutritional labelling helps consumers to choose healthy products within various commercial brands based on their daily food baskets and calorie intakes. This strategy also helps the government to control NCDs and reduce budgets for medical care as a result of NCDs. Experiences in other countries show that nutritional traffic light labelling is a preferred method compared with other labelling guides such as octagons, nutritional claims, logos and numerical levels per serving sizes *(49)*. Therefore, design of graphical feature showing total calorie, salt, sugar, fat and trans-fat indices was motivated by Iran FDA. Despite similar targets of nutritional labelling by different countries *(50)*, differences exist in the details in the labels. For example, most countries include the total calorie, fat, sugar and salt in foods *(50)*; however, level of trans fat

was also added to the nutritional traffic light by the Iranian Food and Drug Administration because of the clear involvement of trans fatty acids in cardiovascular diseases in the country.

Studies that assessed the effectiveness of nutritional traffic light labelling on food selection have shown that raising consumer awareness and knowledge would increase the effects of such interventions *(51,52)*. Thus, the Iranian Food and Drug Administration ran a health campaign to introduce the nutritional traffic light labelling to people. The campaign included educational programmes at schools, interviews in the media and public advertisements. However, this is the beginning of nutritional traffic light labelling in the country and further research must be carried out on consumer perceptions to have a better understanding of effectiveness of this policy.

Conclusion

The Islamic Republic of Iran is a large country with a variety of cultures and dietary behaviours. Our study shows that, in addition to revising food product regulations and encouraging the food industry to reformulate food products, behavioural modifications should be considered by consumers to reduce their risk of NCDs as a result of their diet. In the Islamic Republic of Iran, salt levels in various foods, as well as saturated and trans fatty acids in oil products, decreased through implementation of new national strategies. Furthermore, nutritional traffic light labelling was established as a strategy to raise public awareness. Further studies are needed to assess the effectiveness of these interventions in reducing NCDs in the Islamic Republic of Iran.

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Table 1: Number of standards on salt, and trans and saturated fats related to food items that make up large and small shares of the daily Iranian food basket

Component	Food product		New standard	Modified standard
Salt	**Large share (Ref.)**	**Small share (Ref.)**		
	Bread *(11,12)*		–	2
	Fresh cheese[a] *(13)*		–	1
	Doogh (Iranian fermented drink) *(14)*		–	1
		Probiotic yoghurt *(15)*	–	1
		Other products[b] *(16)*	1	–
Oil				
Trans/saturated fat	Frying oil (household & industry use) *(17)*		–	1
	Semisolid oil for household use *(18)*		–	1
	Table margarine and spread margarine *(19)*		–	1
	Minarine & sweetened minarine[c] *(20)*		–	1
		Shortening *(21)*	–	1
Palm oil	Cheese (fresh cheese[a], lactic cheese, pre-cheese) *(13,22,23)*		–	3
	Butter (pasteurized butter, spread butter) *(24,25)*		–	2
	Minarine[c] *(20)*		–	1

Ref.: reference.

[a]Similar standards have been developed for both indices.

[b]Examples are canned foods, tomato paste, processed olives, sauces and pickles.

[c]Similar standards have been developed for both indices.

Table 2: Changes in maximum permitted percentage of salt in foods that make up a large share of foods bought and consumed

Food (reference)	**Before (%)**	**After (%)**	**Decrease (%)**	**Base year**
Bread *(11,12)*	1.8	1.0	44	2016–2017
Cheese *(13)*	4.0	3.0	25	2015
Doogh (Iranian fermented drink) *(14)*	1.0	0.8	20	2015

Table 3: Changes in permitted percentage of trans and saturated fats in oil products

Product (Ref.)	**Trans fat (%)**		**Saturated fat (%)**	
	Before 2015	**After 2015**	**Before 2015**	**After 2015**
Household use				
Frying oil *(17)*	2	2	No limits	30
Semisolid oil *(18)*	5	2	30	30[a]
Table margarine *(19)*	10	2	40	48
Spread margarine *(19)*	5	2	30	35
Minarine *(20)*	5	2	No limits	60
Industry use				
Frying oil *(17)*	2	2	No limits	45
Minarine *(20)*	5	2	No limits	60
Shortening *(21)*	10	5	No limits	65

Ref.: reference.

[a]This further decreased to 25% in 2018.

Table 4: Cut-off points for the nutritional traffic light labelling *(28)*

Index	**Low level**		**Medium level**		**High level**			
	Per 100 g	**Per 100 mL**	**Per 100 g**	**Per 100 mL**	**Per 100 g**	**Per 100 mL**	**Per serving size**	
Salt	≤ 0.3	≤ 0.3	> 0.3 to ≤ 1.5	> 0.3 to ≤ 0.75	> 1.5	> 0.75	> 1.8	> 0.9
Sugar	≤ 5	≤ 2.5	> 5 to ≤ 22.5	> 2.5 to ≤ 11.25	> 22.5	> 11.25	> 27	> 13.5
Fat	≤ 3	≤ 1.5	> 3 to ≤ 17.5	> 1.5 to ≤ 8.75	> 17.5	> 8.75	> 21	> 10.5
Trans fatty acid	≤ 0.5	≤ 0.5	> 0.5 to ≤ 2	> 0.5 to ≤ 2	> 2	> 2	> 2	> 2

100 g is used for solid foods and 100 mL for liquid foods.

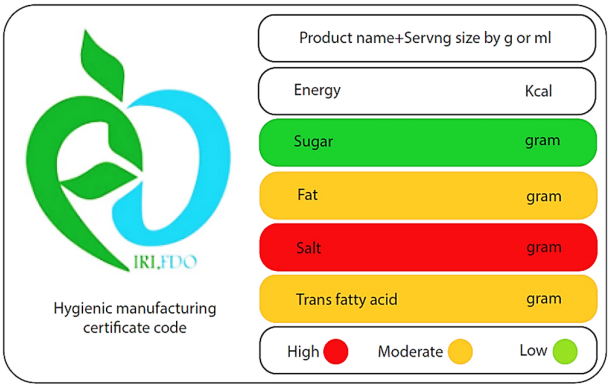

Figure 1: Nutritional traffic light label used for food products in the Islamic Republic of Iran