



# The landscape of preventive cardiology in Turkey: Challenges and successes

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## ARTICLE INFO

### Keywords:

Cardiovascular disease  
Prevention  
Mortality  
Turkey  
LDL-C  
Lifestyle  
Diabetes  
Obesity  
Smoking  
Hypertension

## ABSTRACT

Turkey, like many countries, is facing a growing burden of non-communicable disease (NCD)s and is among the countries with high cardiovascular mortality in Europe. Moreover, Turkey currently has the highest rate of premature cardiovascular disease (CVD) in Europe. During the last decades, Turkey made fundamental reforms in the health system to improve the treatment of risk factors to prevent CVD. The most outstanding success was in the area of tobacco control (13.4% decrease in smoking prevalence) and decreasing the salt consumption of the population (from 18 to 9.9 g/day) leading to a significant decrease in CVD mortality from 45% to 36.8% of all deaths. However, obesity and diabetes are increasing rapidly as a result of urbanization, low physical activity and unhealthy eating and the new generation is starting to take up smoking. The increase in cardiometabolic risk factors and aging of the population are expected to increase the number of CVD deaths. All CVD risk factors except smoking are significantly more prevalent in women. In addition, rare disease is a country specific problem with a significant contribution to the high rates of premature CVD in Turkey. Despite major improvements in management in acute coronary syndromes, sustained achievement in guideline recommended goals is suboptimal. In patients with a previous cardiovascular event smoking rate is 25.5%, 80.9% of these patients are overweight (BMI  $\geq 25$  kg/m<sup>2</sup>), 30% obese (BMI  $\geq 30$  kg/m<sup>2</sup>), and LDL-cholesterol targets of 70 mg/dL are attained in only 18%. Herein, we scrutinize the achievements and challenges of Turkey in establishing a ‘National Heart Health Policy’ aiming to decrease the burden of CVD and its risk factors.

## 1. Introduction

There has been a dramatic increase in deaths from non-communicable disease (NCD)s globally in the last decades. The most recent European Cardiovascular Statistics show that cardiovascular disease (CVD) is still the leading cause of mortality in Europe especially in middle income countries [1]. Turkey is a developing Eurasian country located in the Eastern Mediterranean Region with a population of 85 million. The median age is 32.4 years and while 54% of the population is still under the age of 30 years, the population is aging rapidly (Fig. 1). Demographical projections suggest that half of the population will be over the age of 34 years and 10.2% will be over the age of 65 years in 2023 [2].

Turkey, like many countries, is facing a growing burden of NCDs and is among the countries with high cardiovascular mortality in Europe [1,3–7]. CVD has been the leading cause of all deaths by 40% in 1989, 45% in 1993, 40% in 2009, 38% in 2012, 39.5% in 2017, 37.8% in 2018, and 36.8% in 2019 in Turkey [2]. Age adjusted coronary heart disease (CHD) mortality rates fell between 1995 and 2008 parallel to the falls reported in Western countries [8]. These reductions were mostly

attributed to a better control of risk factors like smoking, high blood pressure, and modern therapies [8] (Graphical Abstract). However, due to aging of the population and increasing rates of diabetes and obesity; mortality due to CVD is projected to increase by about 2.3 times in males and about 1.8 times in females by 2030 [5,6]. Furthermore, Turkey currently has the highest rate of premature myocardial infarction (MI) below the age of 50 in Europe and the mean age at the index coronary event is almost 10 years younger [9–11].

## 2. Major cardiovascular risk factors

The most prevalent risk factors in Turkey are hypertension, tobacco use, obesity, hypercholesterolemia, and diabetes [3,12–16]. Except for smoking, all of these risk factors are significantly more common in women than in men. There are several national surveys conducted in Turkey to determine the prevalence of major risk factors in the adult population. Among these Turkish Adults Risk Factors Study (TARF) – the earliest and longest epidemiological study was a comprehensive cohort study that evaluated CVD and its risk factors in Turkey from 1992 to 2016 [7,17]. More recently, Turkish Society of Cardiology (TSC) conducted meta-analyses enrolling epidemiologic studies

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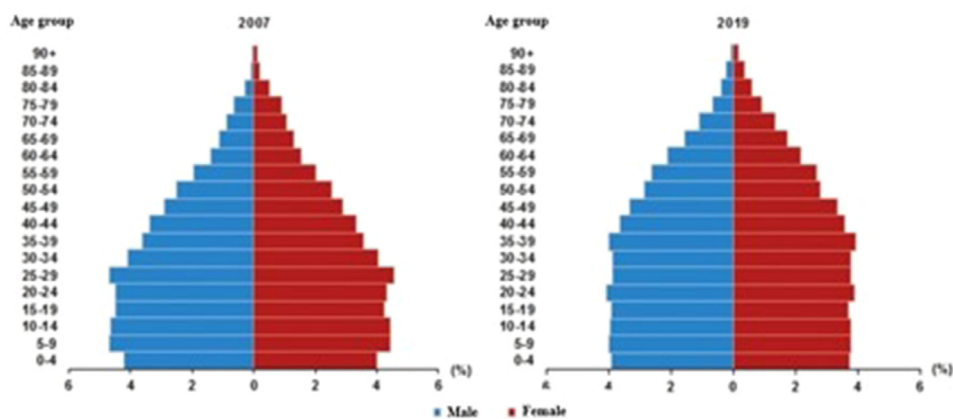


Fig. 1. Population Pyramids of Turkey according to gender (%), years 2007–2019.

Table 1

Crude prevalence of major cardiovascular risk factors in Turkey. There are 3 data sets presented below: (1). the pooled values that are obtained from a recent meta-analysis of epidemiological studies conducted in Turkey during the last 15 years [12–16], (2) 2011-Household study conducted by ministry of Health [18], and (3) 2017- Household Study conducted by Ministry of Health and WHO (STEPSI) [3].

	Meta-analysis conducted by TSC [12–16]			2011-Household Study [18] (aged > 15 years)			2017- Household Study STEPSI [3] (aged > 15 years)		
	Overall	Women	Men	Overall	Women	Men	Overall	Women	Men
Smoking*	30.3%	15.7%	46.1%	30%	17%	43%	31.5%	19.7%	43.4%
Obesity (BMI ≥ 30 kg/m <sup>2</sup> )	28.5%	33.2%	18.2%	24.1%	31.1%	16.2%	28.8%	35.9%	21.6%
Hypertension**	31.2%	36.0%	30.0%	24.0%	26.0%	21.0%	27.7%	29.3%	26.1%
Diabetes mellitus***	14.6%	16.5%	14.3%	11.1%	11.4%	10.8%	11.1%	11.5%	10.6%
Hyperlipidemia****	29.1%	30.2%	27.8%	28.4%	29.6%	26.9%	24.7%	28.5%	20.9%

BMI: Body mass index, LDL: Low density lipoprotein, TSC: Turkish Society of Cardiology.

\* Smoking is defined as current smokers or those who quit smoking less than 1 year before the assessment for all studies. The major fall in smoking rates between 2008 and 2012 were not sustained thereafter.

\*\* Hypertension prevalence is based on medical history and measurements in Meta-Analysis and on medical history and measurements in 2011 National Household Survey. Hypertension was defined as raised blood pressure (BP) (Systolic BP ≥ 140 and/or Diastolic BP ≥ 90 mmHg) or currently on medication for raised BP in STEPS Surveys.

\*\*\* Diabetes mellitus is defined as fasting blood glucose (FBG) ≥ 126 mg/dL and/or being on anti-diabetic medication in Meta-analysis. For 2011 household Study, diabetes was defined as diabetes and medication history, and/or FBG ≥ 126 mg/dL. STEPS survey defined individuals with raised FBG ≥ 126 mg/dL or currently on anti-diabetic medication as diabetes mellitus.

\*\*\*\* Hypercholesterolemia is defined as; LDL-cholesterol ≥ 130 mg/dL and/or cholesterol lowering medication in Meta-analysis and 2011 National Household Survey. STEPS 1 used the total cholesterol (≥ 190 mg/dL) or currently on medication for raised cholesterol criteria for defining hypercholesterolemia.

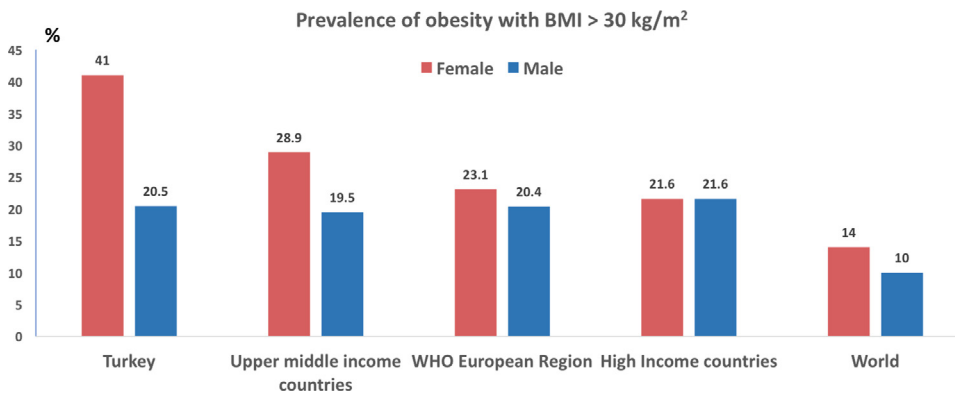
with low bias and high representativeness of the country population distribution using data from the past 15 years [12–16]. These meta-analyses revealed an overall prevalence of hypertension 31.2%, smoking 30.3%, hypercholesterolemia 29.1%, diabetes 14.6%, obesity 28.5%, and metabolic syndrome 43.3%. Finally, the Ministry of health (MoH) conducted two household surveys in the years 2011 and 2017 [3,18]. The latter was conducted in cooperation with World Health Organization (WHO) (STEPwise approach to surveillance) (STEPS 1 Survey). Currently STEPS2 survey is underway. The primary aim of STEPS, which covers all NCDs and risk factors, is to gather all the basic data pertaining to risk factors to start and maintain the chronic disease surveillance [3]. Table 1 shows the crude prevalence of major CVD risk factors generated from the TSC meta-analysis of last 15 years' studies, National Household Survey 2011, and WHO-STEPSI Survey of Turkey.

### 2.1. Smoking

Smoking is still the most important risk factor in Turkey despite major efforts to combat tobacco use. Turkey is the first country in the world to implement the full range of policies to address each of WHO's M-P-O-W-E-R (MPOWER) strategies to reduce tobacco use [19]. After a national smoking ban, several campaigns and programs, prevalence of smoking decreased significantly and rapidly in a relatively short period of time – especially between 2008 and 2012. During that period, an

impressive success was gained in tobacco control, and smoking rates decreased by 13.4% with a set of consistently implemented, wide-ranging policies to reduce the demand for tobacco including tax increases, large health warnings on cigarette packages, bans on advertising, promotion and sponsorship campaigns within mass media, and smoke-free policies in public buildings, working environments, and transportation [3,4,12,19]. Sale of tobacco products to individuals below 18 years of age was banned, and a free national 24 h quit-line service was introduced. Exposure to secondhand smoke in restaurants fell from 55.9 to 12.7% in 8 years [3,12,19,20]. Declines in exposure to second-hand smoke were also seen in workplaces, public transportation, government buildings, and even in homes.

Despite this initial success, with the termination of active campaign against smoking, the smoking rate has started to rise again due to the new generation taking up the smoking habit. Findings from the 2012 Global Adult Tobacco Survey indicated that there were 14.8 million smokers in Turkey (MoH, 2014) putting Turkey the tenth among the countries in which tobacco is consumed the most. Smoking prevalence declined between 2008 and 2012 for both men and women to become 41.5% for men and 13.1% for women by 2012. Currently, Turkey's adult smoking rate is 31.5%, [3,12]. Smoking rate (aged ≥ 15 years) in men is still much higher than in women (43.4% versus 19.7%, respectively) and the age group with the highest smoking rate is 30–44 years (41.8%) [3,19].



**Fig. 2.** International Comparison of the prevalence of obesity with body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>, **Source:** Ministry of Health, 2010; WHO, 2012.

## 2.2. Lifestyle-related risk factors

The unfavorable lifestyle-related risk factors are increasing with urbanization and globalization. Obesity, high salt /sodium consumption, and low level of physical activity are all prevalent and are all higher than the average values for Europe [21,22]. There have been efforts to reduce unhealthy dietary foods, including the adoption of policies on salt including elimination of saltshakers from the restaurant tables, saturated and trans fats, and restrictions on food marketing. As a result of these campaigns, the mean salt intake declined from 18 to 9.9 g/day between 2011 and 2017 and 75.6% of the overall population is aware of the importance of lowering dietary salt intake [3]. However, more than a quarter of the population (28.1%) is still automatically adding salt to the food before tasting [3]. Despite being a Mediterranean country, 87.8% of the population has a consumption level lower than the recommended amount of five servings per day of fruit and vegetables [3]. The average fruit and vegetable consumption is 4.6 and 5.1 days per week, respectively. Overall, the awareness of the health benefits of fruit and vegetable consumption is only 30%.

In general, physical activity level is far from being ideal; 43.6% of the population has insufficient physical activity, defined as < 150 min of moderate-intensity activity per week (33.1% for men and 53.9% for women) [3]. Half (49.4%) of the population were reported to be mildly active, and only 24% engaged in intense level of physical activity [3,18]. Daily median activity duration is 30 min with a 4.3 to 90 interquartile range. Around a quarter (29%) of physical activity is work-related; over half (59.5%) is transport-related and only an eighth is recreational (12.5%). Men significantly have more daily physical activity than women (51.4 min for men and 17.1 min for women).

## 2.3. Obesity

Obesity has significantly increased in the past decade as the inevitable result of unhealthy eating and low level of physical activity with 64.4% of the adult population being overweight (62.8% of men and 66% of women) and 28.8% obese (21.6% of men and 35.9% of women) [3,13]. Turkey has one of the highest obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) rates in Europe (Fig. 2). Average waist circumference is 91.3 cm for males and 87.9 cm for females [3]. The TURDEPII study has calculated the cut-off points of waist circumference of 90.5 cm in women and 95.5 cm in men for increased CVD risk in adult Turkish population [23]. The same study showed a high abdominal visceral obesity prevalence of 53% in the general population (female 64%, male 35%) in 2010 whereas 12 years before the prevalence of abdominal obesity was 34% (female 49%, male 17%) TURDEPI I [24]. A survey on childhood obesity revealed that the prevalence of obesity among children aged 7–8 years was 23.3% in boys and 21.6% in girls. Lack of physical activity, consuming unhealthy food, increased screen time over 2 h/day in 40% of children and decreased playtime less than an hour a day in a third of the children are the main reasons for childhood obesity in Turkey [4,25,26].

The Ministry of Health has prioritized public education and awareness campaigns on physical activity and childhood obesity [4,27]. An action plan to restrict marketing and media advertisements of unhealthy food and restricting sale of unhealthy foods in school canteens has been introduced and public education campaigns have been launched [4,6,26,27]. A recent step has been to standardize the infant/baby formulas to restrict salt and sugar and increase campaigns to encourage breast feeding up to 2 years. All these precautions have helped to blunt but not control the increase in childhood obesity [25,26].

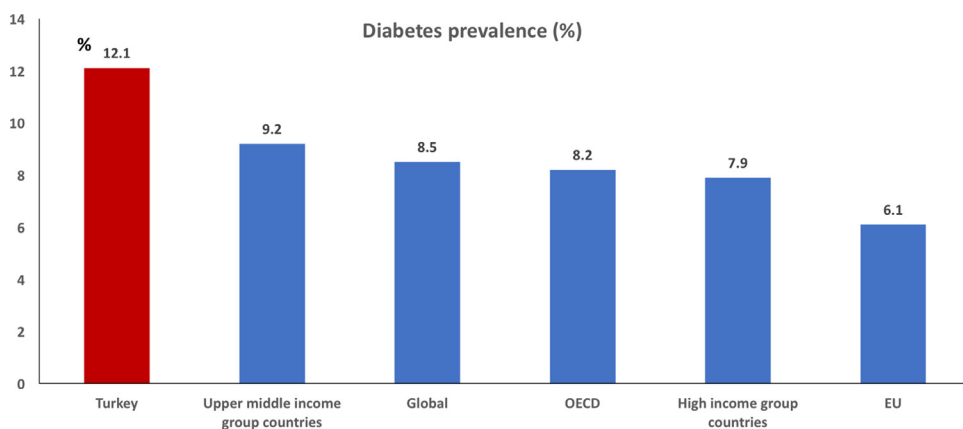
## 2.4. Hypertension

Hypertension is prevalent, with a third of the adult Turkish population having high blood pressure [3,15]. The recent WHO National Household Survey -STEPSI showed that hypertension was more common in women than in men (29.3% women and 26.1% men) in Turkey [3]. The same survey revealed that 13.6% of the adult population had never had their blood pressure measured. The adherence to the blood pressure lowering drugs was low; half the patients with blood pressure over 140/90 mmHg were not on antihypertensive medications.

To combat hypertension, measures to reduce salt intake and awareness campaigns targeting blood pressure and unhealthy lifestyles have been carried out in the past two decades. This has helped to increase the awareness of hypertension among patients with hypertension from 40.7% to 54.7% and proportion of patients on antihypertensive medication from 31.1% to 47.7% [3,28]. A corresponding improvement was attained at the control rate of high blood pressure in treated patients from 20.7% to 53.9% [28]. Factors associated with better control of hypertension were younger age, female sex, residing in an urban area, and higher education level [28]. Despite these efforts, the number of hypertensive patients is still unacceptably high.

## 2.5. Diabetes mellitus

The prevalence of diabetes has increased significantly in the past 20 years from 7% of the adult population to 14.6% of the population [3,16,23,24]. Diabetes prevalence is very high compared to the rest of the world and Turkey is accepted as the country with highest prevalence of diabetes in Europe (Fig. 3) [5]. In the recent WHO National Household Survey -STEPSI 17.3% of the adults had fasting plasma venous glucose  $\geq 126$  mg/dL or HbA1c  $\geq 6.5\%$  or were currently on medication for raised blood glucose (16.3% for men and 18.3% for women) [3]. Diabetes is associated with age, waist circumference, BMI, hypertension in women and age, BMI, and hypertension in men [23]. Furthermore, nearly one in three people in Turkey have metabolic syndrome [3,23,29].



**Fig. 3.** International Comparison of Age Standardized Diabetes Prevalence for 20–79 Age Group, (%), (World Standard Population), Year 2017 Diabetes prevalence refers to individuals with Type 1 and Type 2 diabetes in the 20–79 age group. Country values were age-standardized with World Standard Population by the IDF group. Sources: Turkey Health Statistics Yearbook 2018 (reference No: 5) and IDF Diabetes Atlas 8th Edition, 2017.

## 2.6. Dyslipidemia

Dyslipidemia is another important risk factor for Turkish population. The prevalence of hypercholesterolemia defined as low density lipoprotein (LDL)-cholesterol  $\geq 130$  mg/dL was 29.1% in the general population, 30.2% in females, and 27.8% in males [14]. The prevalence of hypertriglyceridemia ( $\geq 150$  mg/dL) was 36.5% in overall, 32.0% in females, and 41.3% in males. Low high-density lipoprotein (HDL)-cholesterol ( $\leq 50$  mg/dL for females and  $\leq 40$  mg/dL for males) was found in 46.1% of the whole population, (50.7% in females and 41.1% in males). In earlier studies conducted before 2000 low HDL-cholesterol was suggested to be highly prevalent in Turkey with 53% of men and 26% of women having HDL-cholesterol levels  $< 35$  mg/dL [30]. However, newer studies have failed to show HDL-cholesterol levels to be as low [3,14,18,31,32]. This may be due to change in environmental risk factors like decreased smoking rates or using different measurement techniques.

Only 36.9% of those previously diagnosed with raised total cholesterol, were currently on lipid lowering therapy (39.8% for men and 34.9% for women) [3]. Overall, risk factor awareness is suboptimal. The WHO survey showed that awareness of high blood glucose or cholesterol level was low; 35% of the population had never had their blood glucose measured and 45.6% never had their cholesterol level measured [3].

## 3. Secondary prevention

Acute cardiovascular care has improved in the past decade due to guideline implementation, increasing accessibility of percutaneous interventions country wide and better coordination of emergency medical service (EMS) with percutaneous coronary intervention (PCI) centers. However, total ischemic time (time to treatment) is significantly longer than proposed in the guidelines due to patient related factors like under-use of EMS (only 11%) and delayed reaching out to EMS [33]. A community and patient education campaign has been generated recently to resolve the patient related delays to treatment and increase the use of EMS.

The risk of in-hospital mortality of patients presenting with acute MI has halved in the past 20 years [34]. In-hospital management of acute coronary events is satisfactory with a median door-to-balloon time of 36.5 min [33].

Getting to guideline recommended goals to prevent further cardiovascular events is essential but underachieved in Europe and other parts of the world. Similarly, the secondary prevention efforts and risk factor control after discharge are still suboptimal in Turkey. The most prevalent risk factors in patients hospitalized for an acute coronary syndrome (ACS) are hypercholesterolemia (60.2%), hypertension (49.5%), smoking (48.8%), and diabetes (37.9%) [10]. At discharge, the patients are prescribed medications in line with the recent guidelines. However,

these efforts are not sustained, and medication use is significantly decreased 6 months after discharge and onwards especially for statins [11]. Moreover, evaluation of patients 6 to 36 months after an index coronary event has revealed that 25.5% were still smoking, more than half were hypertensive, 80.9% was overweight (BMI  $\geq 25$  kg/m<sup>2</sup>), and 30% was obese (BMI  $\geq 30$  kg/m<sup>2</sup>) and fasting blood glucose was  $> 126$  mg/dL in 29.2% [11].

In secondary prevention, statin treatment in general is initiated by the cardiologists (74%), followed by internists (16.9%), family practitioners (3.8%), and other specialists (1.3%) [35]. The LDL-cholesterol targets of 70 mg/dL are attained in only 18% of the secondary prevention patients attending cardiology outpatient clinics [35]. Only one third of the secondary prevention patients knew their cholesterol levels. Although the statins are widely reimbursed, only 70 to 75% of secondary prevention patients seen in outpatient clinics are on statin therapy and only half of them are on high intensity statins [35,36]. Almost one third had discontinued statin treatment at least once in the past [35]. Negative media information on statins is the most common reason for treatment discontinuations. Other major reasons are low level of awareness of patients, preference of alternative herbal agents, and reluctance of physicians to emphasize use of statins [35,36].

The number of nurses specialized in cardiovascular prevention is limited, nurse-based programs are lacking, and sustained lifestyle changes cannot be implemented in the majority of secondary prevention patients [4]. It has been shown that specialized prevention clinics were most effective for the management of cardiovascular risk factors after ACS [37]. According to EUROASPIRE III, only 7.3% of patients discharged after ACS are attending structured cardiac rehabilitation programs after the index event in Turkey [9]. Although cardiac rehabilitation is reimbursed, the number of structured multidisciplinary secondary rehabilitation centers needs to be increased.

## 4. Prevention in women

Turkish women have an unfavorable cardiometabolic risk profile. Almost all risk factors except smoking are significantly more prevalent in women than in men and are on the rise (Table 1).

In secondary prevention, the treatment goals of blood pressure, LDL-cholesterol, and fasting plasma glucose are all less often attained in women than in men [9,11]. Similarly, physical activity and quality of life indices after hospitalization for coronary heart disease are lower in Turkish women than Turkish men and European women [1,33,38,39]. Women have a higher diabetes prevalence than men in Turkey whereas the opposite is seen in many other countries [1,3,23,39]. This may be explained by a higher prevalence of obesity and a lower level of physical activity in Turkish women.

The hospital course during ACS is also unfavorable for women [34]. The in-hospital mortality for STEMI is almost 3-fold higher in women

compared to men (11.2% vs 3.8%, respectively;  $P < 0.001$ ); whereas no mortality difference was observed for NSTEMI. This excess mortality observed in women persisted up till 1 year. The main factors for the increased risk in women are higher comorbidities, delay in the treatment, and lower implementation of guideline-recommended treatment. In other words, gender inequality still exists 30 years after the first description of the Yentl syndrome [40] despite all the efforts to overcome it. There are several efforts of the Turkish Society of Cardiology and MoH to educate the public and physicians to close the gap.

## 5. Rare cardiovascular diseases

Rare diseases such as homozygous familial hypercholesterolemia, peri-partum cardiomyopathy, and pulmonary hypertension are more frequently seen than the rest of Europe due to the geographical structure, founder effect, and higher consanguinity rates compared to Europe [4]. The impact of these rare disease on cardiovascular outcomes seems to be relevant with genetic dyslipidemias contributing to high rates of premature CVD in Turkey (20–22%) compared to other European countries (10–13%) [9–11]. The frequency of familial hypercholesterolemia is 1 in 100–150 in Turkey whereas the prevalence is 1 in 250 in Europe [41].

The ongoing national rare CVD awareness programs including registries (A-HIT 1,2 for familial hypercholesterolemia, ARTEMIS for peri-partum cardiomyopathy, SIMURG for pulmonary hypertension) will help to understand the burden of these diseases and stimulate improvements in quality and consistency of practice in the region [41–44].

## 6. Structure of healthcare and modifications in the health care system for cardiovascular prevention

Turkey made fundamental reforms in health system called ‘the Health Transformation Program’ [6,45]. The Social Security Institute is the main financer of healthcare. All costs of pharmaceutical and non-pharmaceutical management of diseases are covered by the obligatory general health insurance scheme. The healthcare system is based on primary care physicians (family practitioners) who are also responsible for CVD prevention. Specialized lipid, obesity, and diabetes clinics generally exist in academic centers. The majority of the citizens are followed by a family physician who is responsible for primary prevention, but they are also free to seek healthcare elsewhere. Visits to primary care physicians are free of charge but prescriptions are paid according to the social security status of the individuals. A small co-payment is charged for specialists’ visits. [5,45]. The mean yearly visit to a physician is 10 per citizen. There are several regulations in the prescriptions of anti-lipid, antihypertensive, antidiabetic, and antithrombotic drugs. The regulations are frequently reviewed by health authorities and updated in line with the indications recommended by the ESC Guidelines. Most of the citizens are covered by universal healthcare and 90% of the price of the drugs are reimbursed. Although generic medications are usually free of charge, combination therapy is reimbursed only in a stepwise manner and not if given as upfront combination.

To invest in health and not disease, 207 Healthy Life Centers which are multipurpose structures established to combat risk factors, to encourage a healthy lifestyle, and to strengthen primary health care services have been founded. Healthy Life Centers provide CVD risk factor and nutritional counseling, psycho-social counseling, oral and dental health, women’s and reproductive health, school children’s health, and screening and education, smoking cessation counseling, counseling for drug abuse, and control and management of NCDs, and also cardiac rehabilitation. There is a plan to increase the numbers of healthy life centers according to the burden of NCDs in each province.

Turkey was one of the first counties in Europe to establish a ‘National Heart Health Policy’ aiming to decrease the burden of CVD and its risk factors [46]. A Multisectoral Action-Plan was launched, and its 4

strategic pillars were strengthening national capacities, leadership, governance and partnerships; reducing modifiable and preventable risk factors; strengthening the response of the health system; and monitoring trends and determinants of non-communicable diseases and evaluating progress in their prevention and control [45,46]. For this purpose, a web-based program and management algorithm were established for the use of primary care physicians. The program called ‘e-pulse- (e-nabiz)’ is a personal health record system integrating all the information systems of health institutions covering lab results, medical images, prescription and medication details, and health records that both the physician and patient can access. It is also possible to enter data manually to e-pulse via smart wristbands, blood pressure and blood sugar monitors with wireless features. Recently, the cardiovascular risk assessment system (SCORE-TR) has been integrated to e-pulse. With the activation of the algorithm, all family physicians are now applying routinely the SCORE-TR to every patient over the age of 40 years, to determine the CVD risk and accordingly management of the individual patients and >23,000 family physicians are currently receiving training on a standardized approach to primary and secondary cardiovascular prevention. The second step of this project will be integration of these efforts to secondary care. As an example, an asymptomatic 55-year-old man, past history of smoking, with hypertension and low HDL-cholesterol, who is planning to start running 3 miles per day and wants to know his risk of having a heart attack, would first be seen in a primary care setting, would be assessed for his individual risk by the recalibrated SCORE-TR online risk charts. Depending on the risk and LDL-cholesterol level, he will be given lifestyle and risk factor modification advice and pharmacological treatment to control LDL-cholesterol and blood pressure. If he was found to have high risk, he would be referred to a cardiologist for further evaluation. In case of a need for exercise stress testing to decide if it is safe, exercise stress testing will be performed by the cardiologist.

Turkish Society of Cardiology is very active in spearheading education for CVD prevention. It provides brochures, educational interactive web pages, informative TV and radio programs and campaigns to increase physical activity, promote healthy diet, and awareness about risk factors.

The current pandemic has hampered the preventive efforts with less patients seeking medical care [47–49]. However, important precautions have been taken to avoid unnecessary visits to hospitals and to prevent disruption of chronic treatments; enabling patients to access drugs for chronic diseases from pharmacies without new prescriptions during the pandemic. Despite these efforts, statin use has decreased even in the previously compliant patient groups [47]. Moreover, we are facing less compliance to healthy life behaviors and worsening of CVD risk factors as the pandemic continues. Delays in seeking medical care is another collateral damage of the pandemic.

## 7. Future perspectives

The National Health policy in Turkey has made cardiovascular prevention a priority and every regulatory effort is taken to promote healthy lifestyle habits in Turkey. These intense efforts have led to significant reductions in smoking and high blood pressure. However, for this to be sustainable, the educational and policy efforts need to be continued full strength to impact the new generation. Furthermore, despite all efforts, obesity, metabolic syndrome, and diabetes are on the rise particularly in women. The positive effects of the current efforts to strengthen primary care remains to be seen.

As for secondary prevention, the adoption of current treatment guidelines into practice in terms of interventional and pharmacologic therapies, a great success has been gained in halving the mortality in acute care of MI. However, there is still huge inertia in reaching and sustaining guideline recommended goals in secondary prevention after the index event. Secondary prevention efforts need to be better coordinated and standardized after hospital discharge.

There are several programs and campaigns to raise awareness for early risk factor modification to prevent early MIs. The TSC has launched nationwide campaigns to raise awareness for risk factors called 'Know your numbers' and 'Protect your heart, your loved ones are in it'. Healthy Life Centers are also working along the same line to increase awareness for primordial prevention. Furthermore, a registry of young MI (A-HIT3) is getting started in 50 cardiology centers to figure out the major risk factors of premature MI in the country.

## 8. Conclusion

Access to universal healthcare is an advantage in Turkey and the improved treatment of risk factors has decreased CVD mortality. However, to decrease the CVD epidemic and prevent cumulative exposure to risk factors, primordial prevention is essential. Urbanization and westernized dietary habits associated with excessive calorie intake and sedentary lifestyle are hampering the preventive efforts. Through regulatory and educational efforts, the most substantial contributions so far have been the changes in salt intake, energy intake from saturated fat, and decreasing consumption of unhealthy food. Modeling studies have shown that feasible risk factor improvements in Turkey could prevent or postpone ~ 25 600 deaths from CHD by 2025 [21]. A life-course approach to primordial prevention by promoting desirable lifestyle habits early on in school-age children in order to ensure they develop into healthy adults should be the ultimate goal. Optimal health metrics should be reached early on in life and sustained for prevention to be successful.

## Author contributions

Authors made substantial contributions to the manuscript as follows: the conception and design of the study, and acquisition of data: Authors (LT, MK), analysis and interpretation of data: Authors (LT, MK, BE), and drafting the article: Authors (LT, MK). revising it critically for important intellectual content and final approval of the version to be submitted; Authors (LT, MK, BE)

## Funding

None

## Declaration of Competing Interest

Banu Ekinici has no conflicts of interest.

Meral Kayikcioglu has received honoraria (for lectures and consultancy) from Abbott, Actelion, Astra-Zeneca, Abdi Ibrahim, Aegerion, Bayer Schering, Menarini, Sanofi Genzyme and Pfizer, and research funding from Aegerion, Amyrth Pharma, Amgen, Pfizer, and Sanofi and has participated in clinical trials with Amgen, Bayer Schering, Sanofi, and for the last 3 years.

Lale Tokgozoglu has received honoraria/consultancy fees from Abbott, Actelion, Amgen, Bayer, Daiichi-Sankyo, MSD, Mylan, Novartis, Novo Nordisk, Sanofi, Servier, Pfizer, Recordati and research funding from Amgen.

## Acknowledgments

None.

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