The Need for Immediate Action


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INTRODUCTION

Lebanon, like other countries of the Middle-East and North Africa Region (MENA), is currently witnessing a fast rate of development and modernization with concurrent shifts in diet, physical activity and body composition [1]. These changes provide an understanding of the multidimensional phenomenon of the nutrition transition, which is characterized by increased consumption of energy, fat (especially of animal origin), added sugars and salty foods and decreased intakes of complex carbohydrates, dietary fiber, fruits and vegetables [2-3].

RÉSUMÉ • OBJECTIFS : Examiner la prévalence des facteurs de risque cardiovasculaires, leur évolution temporelle ainsi que leurs associations avec les facteurs nutritionnels et les changements d’habitudes alimentaires au sein de la population libanaise.

MÉTHODES : Les données concernant les facteurs de risque cardiovasculaires et les données sur la consommation alimentaire au Liban ont été recueillies grâce à l’étude un sommaire des bases de données électroniques a été effectuée en combinant différents mots-clés.

RÉSULTATS : L’évolution temporelle de la prévalence des facteurs de risque cardiovasculaires au Liban souligne un accroissement considérable des taux d’obésité, accompagné d’un accroissement des taux d’hypertension, de diabète et d’hyperlipidémie. Les enquêtes de consommation alimentaire démontrent une transition nutritionnelle avec l’adoption de nouvelles habitudes alimentaires caractérisées par une augmentation de l’apport énergétique et de la consommation de matières grasses et animales et une diminution concomitante des apports en glucides et céréales.

CONCLUSION : L’adoption d’un régime alimentaire athérogène et l’augmentation considérable de la prévalence des facteurs de risque cardiovasculaires suggèrent que la population libanaise est à un risque accru de maladies cardiovasculaires. Ces résultats signalent l’importance de formuler des stratégies d’intervention multisectorielles, ciblant à la fois l’individu et la population, permettant d’arrêter la progression au Liban des maladies chroniques liées à la nutrition. De même, des efforts de santé publique visant à promouvoir l’adoption d’habitudes alimentaires saines doivent être immédiatement envisagés.

Mots-clés : régime alimentaire ; maladies cardiovasculaires ; facteurs de risque, transition nutritionnelle, Liban.
nization and their effects on income, lifestyle and food availability are considered the major factors [4]. Through its characteristic changes in food consumption and dietary patterns, the nutrition transition is a common modifiable cause of non-communicable diseases (NCDs) [5]. This is important to health policy planners in Lebanon as a rapid shift in morbidity and mortality towards much higher NCD rates has dominated the health profile of the Lebanese population. In particular, cardiovascular diseases (CVDs) are increasingly recognized as the leading cause of death in Lebanon, accounting for around 60% of all-cause mortality in persons aged 50 years and older [6].

Recognizing the above, major resources are directed towards the promotion of prevention strategies – both primary and secondary. The role of nutrition in modulating major risk factors for CVDs (obesity, diabetes, hypertension, hyperlipidemia and the metabolic syndrome), and hence in the prevention of CVD is currently well-established [7-11]. Recent evidence shows that dietary factors such as vegetables, nuts, and “Mediterranean” dietary patterns play a strong protective role against CVDs while the intakes of trans-fatty acids and foods with high glycemic index are associated with a higher risk [12]. There is consistent evidence that high-fat meals have a detrimental effect on postprandial vascular function, an integrative marker of CVD risk [13]. More specifically, the types of dietary fat are also implicated in modulating the risk of CVDs, with saturated fatty acids (SFA) and dietary cholesterol being linked to increased levels of serum total cholesterol and LDL-C [12, 14]. Conversely, replacing saturated fat with polyunsaturated fatty acids was associated with beneficial effects on lipid levels and thus on cardiovascular health [15-16].

The aim of this paper is to review the burden of CVD risk factors in Lebanon and their association with dietary behaviors as nutrition transition is unfolding in the country. It reports on the population’s nutritional intakes, the prevalence of diet-related CVD risk factors, and their trends over time. The paper builds on previous studies of the dietary and epidemiological changes among the Lebanese population and focuses on some unique nutritional issues, including the much higher level of fat intake in the diet, the high levels of obesity and other cardiovascular risk factors such as dyslipidemia and the metabolic syndrome.

METHODS

The methodology used in the present paper is similar to the one applied in our recent review on CVD risk factors and the nutrition transition in the MENA region [1]. Accordingly, we have gathered data, where available, from individual studies and systematic review articles that have reported on the burden of diet-related CVD risk factors in Lebanon. These include obesity, hypertension, diabetes, metabolic syndrome, abnormal blood lipids and lipoproteins, and dietary/nutritional intakes.

Electronic databases (MedLine, PubMed, Scopus, and Google Scholar) were searched using combinations of key terms (Lebanon and individual CVD risk factors). The reference lists were also reviewed to identify additional data sources. In addition, surveys and studies that reported on the country’s food consumption patterns and dietary habits were also reviewed. For this purpose, electronic databases (MedLine, PubMed, Scopus, and Google Scholar) were searched using combinations of key terms (Lebanon, diet, nutrition, consumption patterns; dietary intake; dietary patterns). The articles consulted for this paper included scholarly publications irrespective of the demographics (age and gender) of the population studied.

RESULTS

Overweight and obesity

Available data indicate that the prevalence of obesity in Lebanon has reached high levels approaching those reported from developed countries such as the USA and Europe, were 32.2 and 10-20%, respectively, of the adult population are reported as obese (Body mass index, BMI ≥ 30) [1, 17-18]. Studies on adult men and women in Lebanon show that obesity prevalence rates have increased during the past decade from 17% in 1997 to 28.2% in 2009 [1, 19], an increase that surpasses that reported from several developed countries during the past decade, including the US [20] (Table 1). Assuming a linear trajectory in obesity rates over time, the prevalence of obesity among Lebanese adults is expected to approach 40% by the year 2020 (Figure 1). These findings carry important public health implications. Obesity is associated with increased mortality and morbidity from CVDs, with the adipose tissue being increasingly recognized as a key player in obesity-mediated CVD [8]. A collaborative analysis of data from almost 900,000 adults in 57 prospective studies indicated that each 5 kg/m² increase in BMI above the optimal range of 22.5-25 kg/m² was associated with a 30% increase in all-cause mortality (40% for vascular; 60-120% for diabetic, renal, and hepatic; 10% for neoplastic; and 20% for respiratory and for all other mortality) [21].

Of more concern is the high prevalence of pediatric overweight and obesity in the country. Based on a nationally representative survey conducted in 1997, the prevalence of overweight amongst 6- to 19-year-old children was estimated as 21.7% and obesity as 6.5% [22]. The highest levels of overweight and obesity were noted among adolescent boys (12-19 years), among whom 29.3% were either overweight or obese (BMI ≥ 85th percentile for sex and age), which is of comparable magnitude to the levels reported from the US in the late 1990s (30.5%) [22-23]. Similar findings were also reported by Chakar and Slameh (2006) in a cross sectional study of adolescents in private Lebanese schools [24].

Parallel to the secular increase in the prevalence of adult obesity that Lebanon is witnessing, pediatric obesity is also following an alarming increasing trend over
time, as suggested by the recent findings of the Nutrition and Non-Communicable Disease Risk Factor Survey conducted between 2008 and 2009 (Sibai and Hwalla, unpublished data). This increase in pediatric obesity is of public health concern given that it is shown to track into adulthood [25] and to predict a broad range of adverse health effects including hypertension, type 2 diabetes, insulin resistance and the metabolic syndrome [26-27]. A recent systematic review documented strong evidence for a significantly increased carotid intima-media thickness, an indicator of early atherosclerotic lesion, in obese children and adolescents as compared to healthy controls [27]. Furthermore, childhood obesity has been also shown to be associated with a proinflammatory and prothrombotic state in children that have not yet reached puberty [28], and to thus significantly increase the risk of cardiovascular diseases.

Obesity is a complex multifactorial phenotype, but the adherence to a diet characterized by high intakes of refined carbohydrates, added sugars, fats, and animal-source foods has been associated with increased risk of obesity [3]. A recent cross-sectional population-based survey (n = 2048 Lebanese adults) conducted by our research group revealed a positive association between obesity and the “Western” dietary pattern, characterized by the consumption of high fat fast foods, sweets and soda drinks [29]. Similarly, a study conducted on adults from rural areas in Lebanon showed that adherence to the Mediterranean diet is negatively associated with waist circumference (WC), and that a 2-point increase in the composite Mediterranean score is associated with a decrease in BMI of 0.51 and 0.78 kg/m² and a decrease in WC of 2.77 and 4.76 cm in men and women, respectively [30].

**Hypertension**

Parallel to the increasing trend in obesity prevalence, emerging data suggest a rising trend in the prevalence of hypertension over time in Lebanon, with its prevalence increasing by almost 1.5 folds in the past decades (from 22.8 to 31.2%) [31-32] (Table I). Assuming a linear trajectory over time, the prevalence of hypertension among

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**TABLE I**

PREVALENCE (%) of NUTRITION-RELATED CARDIOVASCULAR DISEASE RISK FACTORS in the ADULT LEBANESE POPULATION

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Survey</th>
<th>Year</th>
<th>Sample size (n)</th>
<th>Age group (years)</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>Sibai et al. [19]</td>
<td>1997</td>
<td>1216</td>
<td>≥ 20</td>
<td>17.0</td>
</tr>
<tr>
<td></td>
<td>Sibai et al. [1]</td>
<td>2009</td>
<td>2697</td>
<td>≥ 20</td>
<td>28.2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>WHO Infobase [31]</td>
<td>1999</td>
<td>2846</td>
<td>25-65</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>Thome et al. [36]</td>
<td>2004</td>
<td>2125</td>
<td>≥ 30</td>
<td>13.8</td>
</tr>
<tr>
<td>Hypertension</td>
<td>WHO Infobase [31]</td>
<td>1999</td>
<td>2846</td>
<td>25-65</td>
<td>22.8</td>
</tr>
<tr>
<td></td>
<td>Sibai et al. [32]</td>
<td>2010</td>
<td>499</td>
<td>18-65</td>
<td>31.2</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>WHO Infobase [31]</td>
<td>1999</td>
<td>2846</td>
<td>25-65</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>Sibai et al. [32]</td>
<td>2003</td>
<td>499</td>
<td>18-65</td>
<td>36.9</td>
</tr>
<tr>
<td>High LDL-C</td>
<td>Sibai et al. [32]</td>
<td>2003</td>
<td>499</td>
<td>18-65</td>
<td>32.1</td>
</tr>
<tr>
<td>Low HDL-C</td>
<td>Sibai et al. [32]</td>
<td>2003</td>
<td>499</td>
<td>18-65</td>
<td>49.3</td>
</tr>
<tr>
<td>Hypertriglyceridemia</td>
<td>Sibai et al. [32]</td>
<td>2003</td>
<td>499</td>
<td>18-65</td>
<td>35.3</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td>Sibai et al. [32]</td>
<td>2003</td>
<td>499</td>
<td>18-65</td>
<td>25.4</td>
</tr>
</tbody>
</table>

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**FIGURE 1.** Secular linear trends in the prevalence (%) of obesity, diabetes and hypertension among Lebanese adults.
Lebanese adults is expected to exceed 50% by the year 2020 (Figure 1).

Obesity-related hypertension is increasingly recognized as a distinct hypertensive phenotype involving complex and interdependent mechanisms [33]. Overweight and obesity are associated with adipose tissue dysfunction, characterized by enlarged hypertrophied adipocytes, increased infiltration by macrophages and marked changes in the secretion of adipokines and free fatty acids [33]. This results in chronic vascular inflammation, oxidative stress, activation of the renin-angiotensin-aldosterone system and sympathetic overdrive, eventually leading to hypertension [33].

In addition to obesity, evidence from population-based studies document a link between several nutrients, minerals, food groups and dietary patterns and the risk of hypertension. In particular, evidence suggests that dietary sodium is associated with elevation of blood pressure [34].

Based on a recent national survey conducted in Lebanon (Hwalla et al., unpublished data), 55% of Lebanese adults were found to exceed the maximal sodium intake level of 2300 mg/day as recommended by the Institute of Medicine [35], thus predisposing towards increased risk of hypertension and associated cardiovascular diseases such as stroke, left ventricular hypertrophy and coronary heart disease [9]. Also, similar to reports issued by the Center for Disease Control (CDC), processed foods are contributing the most to dietary salt intake in Lebanon, with bread being the highest contributor.

**Diabetes**

Even though the prevalence of diabetes among adults in Lebanon (13.8%) [36] appears to be lower than that reported from most other countries in the MENA region including Bahrain (25.5%), UAE (23.3%) and KSA (23.7%) [1], it was found to exceed the worldwide prevalence rates of diabetes among adults aged 20-79 years (6.4% in 2010) [37]. Available data also suggest that prevalence rates of diabetes are following an escalating trend over time in Lebanon, increasing from 11.6% in 1999 to 13.8% in 2004 [31, 36] (Table I). Moreover, given the well-established association between excess body fat, impaired glucose tolerance and type 2 diabetes (DM II), the increasing prevalence of obesity that the country is witnessing is expected to lead to further increases in the incidence and prevalence of diabetes in the Lebanese population in the future [38]. This is corroborated by a recent report suggesting that, worldwide, the greatest relative increase in the number of people with diabetes is expected to occur in countries of the Middle Eastern crescent [39]. Available data suggest that, assuming a linear trajectory in diabetes rates over time, the prevalence of diabetes among Lebanese adults is expected to approach 20% by the year 2020 (Figure 1).

Diabetes is a well-recognized risk factor for cardiovascular diseases [10], with the common conditions co-existing with diabetes (e.g., hypertension and dyslipidemia) acting as major risk factors for CVD, in addition to diabetes itself conferring independent risk [10]. More importantly, there is compelling evidence that diabetes can be prevented or its onset delayed by lifestyle interventions, including dietary strategies [38]. Studies on the association between diabetes and dietary factors are lacking in Lebanon, however, strong evidence highlights a close link between nutrition, a modifiable risk factor, and the risk of DM II. Available evidence suggests that diets high in saturated fat, Trans fat, high glycemic index foods and low in fiber, fruits and vegetables and whole grains are positively associated with increased diabetes risk [38].

**Blood lipids, lipoproteins and the metabolic syndrome**

A study conducted on a random sample of Lebanese adults (n = 499) highlighted a high prevalence of dyslipidemia with 36.9% of adults being hypercholesterolemic, 35.3% hypertriglyceridemic, 32.1% having high LDL-levels and 49.3% having low HDL levels [32] (Table I). Available data also suggest an increasing trend in the prevalence of dyslipidemia, and in particular hypercholesterolemia, the prevalence of which was estimated at 18.4% in 1999 [31-32].

Based on the ATPIII classification criteria, the prevalence of the metabolic syndrome (MS), a constellation of cardiometabolic risk factors, was estimated at 25.4% in Lebanese adults, a value which approaches that reported for US adults (27%) [40] and exceeds values reported from several European countries (11.5%) [41]. Abdominal obesity and low HDL-C were the factors that contributed the most to the overall prevalence of MS [32].

Of more concern is the high prevalence of MS documented among obese children and adolescents in Lebanon. Based on the modified Adult Treatment Panel III definition, the MS was identified in 26.4% of obese prepubertal children (n = 140) [42] and 24% of obese adolescents (n = 263) [43], thus exceeding prevalence rates reported among obese youth from several developed countries such as France (14.9%) [44], Italy (16.5%) [45] and Spain (18.0%) [46].

Even though the metabolic syndrome, as a disease category, faces substantial controversy, the diagnosis of the metabolic syndrome (MS) appears to identify substantial additional cardiovascular risk above and beyond its individual risk factors. Emerging evidence points to the presence of early functional, and morphologic, changes to the heart and blood vessels. These may be apparent in obese subjects with the MS as early as in childhood [42-43, 47]. The inflammatory response related to fat accumulation may influence cardiovascular risk through its involvement not only in body weight homeostasis, but also in coagulation, fibrinolysis, endothelial dysfunction, insulin resistance (IR) and atherosclerosis [8]. Moreover, there is evidence that oxidative stress may be a mechanistic link between several components of MS and CVD, through its role in inflammation and its ability to disrupt insulin-signaling. The cross-talk between impaired insulin-signaling and inflammatory pathways enhances both metabolic
insulin resistance and endothelial dysfunction, which syn-
ergize to predispose to CVD [8].

Available evidence suggests a close association
between the MS and diets high saturated fat, Trans fat,
sugars and low in dietary fiber, fruits and vegetables
[48]. A cross-sectional study conducted on a random
sample of Lebanese adults (n = 323) showed a significant
association between a dietary pattern that is based
on fast foods and desserts with the metabolic syndrome.
Compared with participants in the lowest quintile of the
Fast Food/Dessert pattern, those in the highest quintile
had significantly higher odds for MS (OR: 3.13; 95% CI:
1.36-7.22) [49].

Food consumption changes in Lebanon paralleling
CVD risk factors

Having clearly demonstrated in the sections above the
alarming increases in various nutrition-related CVD risk
factors over the past period, we find that this can be, in
part, attributable to documented changes associated with
eating habits and dietary practices. Based on two nation-
als surveys, the first conducted in 1997 and the second in
2009, energy intake amongst the Lebanese adult population
was found to increase from 1789.5 kcal/day (Sibai
et al., unpublished data, 1997) to 2591 kcal/day (Hwalla
et al., unpublished data, 2009). Moreover, food con-
sumption surveys conducted in the past decade have
essentially documented a high intake of dietary fat, with
its contribution to energy intake ranging between 36 and
39% [50-52], thus exceeding the WHO recommended
value of 30% of total energy intake [53].

A food consumption survey conducted in 2001 in the
capital Beirut [51], showed that 45.3% of urban Lebanese
adults consume less than the recommended 400 g of fruits
and vegetables [53] per day, while the intake of free sugar,
as defined by the WHO, was found to contribute 11.4% to
daily energy intake, thus exceeding the maximal intake
limit of 10% [53]. The aforementioned study also docu-
mented a low consumption of fish (19.7 g/day), with
73.6% of subjects consuming less than the recommended
two servings of fish per week [54]. Worse, when com-
pared to subjects aged 35 years and older, younger adults
(25-34 years) had significantly higher intakes of soft
drinks, pre-packed juices, alcoholic beverages, sugar and
sugar derivatives, and significantly lower intakes of
cooked vegetables and pulses [51]. In accordance with
data reported from other parts of the world, these findings
suggest that the younger population in Lebanon is at an
increased risk of adopting the westernized dietary pattern
characterized by increased energy-dense diets that are low
in fiber, fruit and vegetables, and high in fats and sugars
[51, 55]. This is not restricted to urban areas as rural
regions in the country appear to be also experiencing the
nutrition transition [56, 52]. A recent cross-sectional study
conducted on 798 adults (40-60 years old) in rural areas
of Lebanon documented a low adherence to the Mediter-
ranean dietary pattern with the consumption of whole-
grain cereals, legumes, olive oil and fish reported as “less
frequent” compared to the consumption of refined cereals,
liquid sweets, fats and oils and dairy products [30].

The data presented above are confirmed by several
other studies conducted in the country which reported a
shift in food consumption towards increased fat, milk
and animal protein and a decrease in the intake of non-
refined carbohydrates, in particular breads and cereals
[55, 57]. The contribution of bread and other cereal pro-
ducts to daily energy intake was in fact reported to drop
from 58 to 36% between 1964 and 1998 [57]. This was
accompanied by a reduction in the contribution of carbo-
hydrates to daily energy intake (Figure 2), which de-
creased from 66% to 57% between 1967 and 2001, with
a concomitant increase in fat supply [58-59].
The secular increase in energy intake, the rather high contribution of fat to daily energy intake, coupled to the low intake of whole grain cereals, fish and the relatively high percentage of people consuming less than the recommended amount of fruits and vegetables suggest that the Lebanese population is at increased risk of cardiovascular diseases, obesity and other NCDs.

CONCLUSIONS AND RECOMMENDATIONS

This review on CVD risk factors and dietary shifts in Lebanon addresses a broad range of public health challenges associated with the accelerated increase in energy-dense diets and adoption of unhealthy lifestyles.

Lebanon, like other countries of the MENA region, is witnessing rapid urbanization, economic growth, technical change and modernization [1]. All of this has brought about a significant change in dietary patterns towards unfavorable consumption choices and, subsequently, an alarming increase in nutrition-related diseases [1].

During the past 30-40 years, the intakes of energy, sugars and fats have increased considerably, with a parallel increase in the proportion of energy derived from animal-based products and a decrease in the contribution of cereals and fruits to energy intake. These changes and the observed shifts in the Lebanese diet are likely to lead to higher intakes of saturated fat, refined carbohydrates and sugars and a lower intake of dietary fiber. It is probable that such a dietary pattern has contributed to the alarming escalating trend in the prevalence of obesity in the country. Although a disease in itself, obesity is considered an underlying and modifiable risk factor for CVDs [1]. As BMI increases, the risk of mortality from CVD increases for both men and women. It is increased by 20-40% at a BMI of 25.0 and by 2-3 times at a BMI greater than 30 [1,60]. Obesity also increases the cardiovascular risk through other mechanisms, including its comorbidity with hypertension, diabetes and unfavorable blood lipids [8], all of which appear to be following an increasing trend in their prevalence and burden among the Lebanese population.

The observed gradual and consistent shift towards an atherogenic diet coupled to the alarming increase in diet-related cardiovascular risk factors carry significant public health implications at the national level. Of more concern is the increasing trend in obesity among Lebanese children and adolescents, given that childhood obesity is known to track into adulthood and to predict a wide

**TABLE II**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Physicians can facilitate behavioral change by</strong></td>
<td>➢ Ensuring the patient understands the relationship between lifestyle and disease</td>
<td>➢ Development of comprehensive health strategies at the national level, based on</td>
</tr>
<tr>
<td>➢ Gaining commitment to lifestyle change</td>
<td>➢ Monitoring the dietary intake for all population groups</td>
<td>➢ Development of a multicomponent, population-based CVD prevention programme</td>
</tr>
<tr>
<td>➢ Involving the patient in identifying risk factors to change</td>
<td>➢ Monitoring the prevalence and incidence of CVDs and associated risk factors</td>
<td>➢ Monitoring the outcomes of policy and programmes in follow-up studies.</td>
</tr>
<tr>
<td>➢ Exploring potential barriers to change</td>
<td>➢ Identification of policy goals for the development of an evidence-based national framework for action</td>
<td>➢ Empowering local planning authorities to restrict permission for take-aways and other food retail outlets in specific areas, such as within walking distance from schools.</td>
</tr>
<tr>
<td>➢ Reinforcing the patient’s efforts to change</td>
<td>➢ Promoting policies which are likely to encourage healthy eating</td>
<td>➢ Development of culture-specific food-based dietary guidelines aiming at decreasing the consumption of saturated fat, Trans fat, sugar and salt</td>
</tr>
<tr>
<td>➢ Using a multimodal team approach involving experts in behavioral medicine and nutrition</td>
<td>➢ Creation of local and national conditions which support a reduction in the amount of saturated and Trans fat in foods</td>
<td>➢ Establishing and implementing clear nutritional labeling regulations and legislation</td>
</tr>
<tr>
<td>➢ Individualizing, if possible, intervention programs.</td>
<td>➢ Restriction of marketing, advertising and promotion of foods and drinks high in fat, salt or sugar</td>
<td>➢ Monitoring the outcomes of policy and programmes in follow-up studies.</td>
</tr>
<tr>
<td><strong>Physicians can recommend healthy food choices by</strong></td>
<td>➢ Advising patients about food choices that are associated with a lower CVD risk.</td>
<td></td>
</tr>
<tr>
<td>➢ Advising high risk persons to receive expert dietary advice, if feasible</td>
<td>➢ If feasible</td>
<td></td>
</tr>
<tr>
<td>➢ Encouraging patient to:</td>
<td>➢ Consuming a wide variety of foods</td>
<td>➢ Development of a multicomponent, population-based CVD prevention programme</td>
</tr>
<tr>
<td>➢ Consuming fruits, vegetables, whole grain cereals, fish, lean meat, low fat dairy products</td>
<td>➢ Balance energy intake with energy expenditure</td>
<td>➢ Monitoring the dietary intake for all population groups</td>
</tr>
<tr>
<td>➢ Balance energy intake with energy expenditure</td>
<td>➢ Replace saturated fat with mono- and polyunsaturated fat (vegetables and marine)</td>
<td>➢ Monitoring the prevalence and incidence of CVDs and associated risk factors</td>
</tr>
<tr>
<td>➢ Limiting sodium intake from all sources</td>
<td>➢ Limiting intake of free sugars.</td>
<td>➢ Identification of policy goals for the development of an evidence-based national framework for action</td>
</tr>
<tr>
<td>➢ Limit intake of free sugars.</td>
<td>➢ Promoting policies which are likely to encourage healthy eating</td>
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88 Lebanese Medical Journal 2014 • Volume 62 (2) L. NASREDDINE et al. – Diet and CVD risk factors in Lebanon
array of adverse health effects, including the metabolic syndrome and increased cardiovascular risk.

Taken together, these findings should alert to the importance of formulating policies and strategies to halt the progression of diet-related NCDs, and particularly CVDs, in the country, and highlight an urgent need for immediate actions that channel public health efforts into the promotion of a healthy lifestyle [1]. Clearly, one of the principle risk factors that can be modified through behavioral changes is an unhealthy diet [1]. The North Karelia project in Finland was able to reduce the burden of CVD by 70% through the promotion of good nutrition and the implementation of food policies [61]. Table II summarizes a set of recommendations for interventions focusing on changes at the individual as well as the population level, within the context of cardiovascular disease prevention [11, 62].

Physicians and health care practitioners can play an important role in moderating the prevalence of cardiovascular risk factors through facilitating lifestyle changes, encouraging the adoption of healthy dietary habits and assisting patients in identifying barriers to behavior change [11]. In addition, nutritional education on the importance of a healthy diet at the population level and developing policies to facilitate the availability of healthy foods could reduce the rapid increasing trend in obesity and other chronic diseases. As suggested for the MENA region [1], population-wide community-based intervention programs that involve multisectoral partnerships and that are responsive to the socio-cultural norms of the Lebanese population must be put in place [1, 61]. Strategies that address CVDs need to be put in place in order to develop an evidence-based national framework for action against CVD, to increase the public and professional awareness of the burden of CVDs and associated risk factors, to improve local and national surveillance of CVDs, to enhance the training of physicians and public health practitioners, and to adopt specific programs of proven effectiveness to prevent and control CVDs and their major risk factors [1].

REFERENCES


