



Cardiovascular risk factors in the Maghreb. A systematic review.

Les facteurs de risque cardiovasculaire aux pays du Maghreb. Revue systématique.

عوامل الإختطار القلبية الوعائية في المغرب الكبير. مراجعة منهجية

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RÉSUMÉ

Objectif: Décrire la distribution des facteurs de risque cardiovasculaire aux pays du Maghreb

Méthodes: Il s'agit d'une revue systématique de la littérature ayant porté sur les articles et rapports, ayant appliqué la démarche «STEPwise» de l'OMS, ou une approche similaire, étudiant les facteurs de risque cardiovasculaire aux pays du Maghreb: Tunisie, Maroc, Algérie, Lybie et Mauritanie, entre 2004 et 2018.

Résultats: Cinq articles ont été sélectionnés, un rapport pour chaque pays. La prévalence du tabagisme était entre 13,4% (12,2-14,6) au Maroc et 29,4% (28,3-30,4%) en Tunisie. En Mauritanie, 50,6% de la population avait une activité physique insuffisante. La prévalence de l'hypertension artérielle était maximale en Libye (40,6%). La prévalence de l'obésité était importante, atteignant 41,1% (37-43,3) pour les femmes et 21,4% (19-23,8) pour les hommes en Libye. La prévalence du diabète sucré était entre 10,6% (9,7-11,6) au Maroc et 16,4% (14,7-19,1) en Libye.

Conclusion: La distribution des facteurs de risque cardiovasculaire, aux pays du Maghreb, a montré que le niveau de risque cardiovasculaire était élevé notamment dans le Maghreb central. Ceci atteste la transition épidémiologique assez avancée en rapport avec la modernisation rapide des pays du Maghreb, d'où l'importance d'un projet intégré de lutte contre les maladies cardiovasculaires, fondé sur l'expérience mondiale.

Mot clés: Facteurs de risque - Maladies cardiovasculaires- Organisation Mondiale de la santé- Tunisie – Maroc – Algérie – Libye - Mauritanie

SUMMARY

Objective: To assess the distribution of cardiovascular risk factors in Maghreb's countries.

Methods: It is a systematic review including articles and reports that applied the WHO "STEPwise" approach, or a similar approach, studying cardiovascular risk factors in the Maghreb countries: Tunisia, Morocco, Algeria, Libya and Mauritania between 2004 and 2018.

Results: We selected five articles, a report for each country. The prevalence of smoking was between 13.4% (12.2-14.6) in Morocco and 29.4% (28.3-30.4%) in Tunisia. 50.6% of the population of Mauritania had insufficient physical activity. The prevalence of high blood pressure was highest in Libya (40.6%) The prevalence of obesity was up to 41.1% (37-43.3) for women and 21.4% (19-23.8) in men in Libya. The prevalence of diabetes mellitus was between 10.6% (9.7-11.6) in Morocco and 16.4% (14.7-19.1) in Libya.

Conclusion: The distribution of cardiovascular risk factors in the Maghreb countries shows that the level of cardiovascular risk is high, particularly in the central Maghreb. This attests to the fairly advanced epidemiological transition related to the rapid modernization of the Arab countries, hence the importance of launching an integrated project for the fight against cardiovascular diseases based on the global experience.

Key words: Risk Factors - Cardiovascular diseases - World Health Organization- Tunisia- Morocco - Algeria – Libya - Mauritania

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الملخص

الهدف: وصف توزيع عوامل الإختطار القلبية الوعائية في الدول المغاربية. **الأساليب:** أجريت هذه المراجعة المنهجية حول المقالات والتقارير التي طبقت منهج منظمة الصحة العالمية "التدريجي"، أو منهج مماثل، لدراسة عوامل الإختطار القلبية الوعائية في بلدان المغرب الكبير: تونس والمغرب والجزائر وليبيا وموريتانيا بين 2004 و عام 2018.

النتائج: اخترنا خمس مقالات، واحدة لكل بلد. كان معدّل التدخين بين 13.4% (12.2-14.6) في المغرب و 29.4% (28.3-30.4%) في تونس. 50.6% من سكّان موريتانيا مارسوا نشاطاً بدنياً غير كاف. كان معدّل ارتفاع ضغط الدم أعلى في ليبيا (40.6%) وكان معدّل انتشار السمنة مرتفعاً في ليبيا 41.1% (37-43.3) للنساء و 21.4% (19-23.8) للرجال. كان معدّل انتشار داء السكّري بين 10.6% (9.7-11.6) في المغرب و 16.4% (14.7-19.1) في ليبيا.

الخلاصة: وضّح توزيع عوامل الإختطار القلبية الوعائية في الدول المغاربية أنّ مستوى مخاطر القلب والأوعية الدموية مرتفع، خاصة في وسط المغرب الكبير. ويشهد ذلك على الانتقال الوبائي المتقدم إلى حدّ ما والمتعلّق بالتحديث السريع للمجتمعات المغاربية، ومن هنا تأتي أهمية إطلاق مشروع متكامل لمكافحة أمراض القلب والأوعية الدموية، بناءً على الخبرة العالمية

الكلمات المفتاحية: عوامل الإختطار - أمراض القلب والأوعية الدموية - منظمة الصحة العالمية - تونس - المغرب - الجزائر - ليبيا - موريتانيا

INTRODUCTION

CardioVascular Diseases (CVD) are a main part of Non-Communicable Diseases (NCD) (along cancers, chronic respiratory diseases and diabetes) which are responsible for more than 36 million deaths annually and for almost 70% of all deaths worldwide (1). CVD are the leading cause of disability-adjusted life years, morbidity and mortality globally(2). Actually, CVD are responsible for approximatively one third of all deaths worldwide (3). The World Health Organisation (WHO) is thus ambitiously aiming at lowering mortality related by NCD and CVD. Analysing the global epidemiological data shows that most of CVD-related deaths occur in low and middle-income countries.

The cornerstone of the prevention and decreasing the morbidity related to CVD is the identification of the common risk factors and their prevention and control. The major risk factors for CVD are divided into behavioural, physical and biological factors. The main behavioural factors are tobacco use, harmful alcohol consumption, unhealthy diet (low fruit and vegetable consumption) and physical inactivity. Concerning physical and biological aspects, four factors were incriminated which are overweight and obesity, raised blood pressure, raised blood glucose and abnormal blood lipids.

In this context, the WHO uses a standardised approach, "STEPwise" approach, for collecting, analysing and disseminating data in WHO member countries, particularly related to NCD and CVD and their common risk factors.

METHODS

In this systematic review, we analysed articles that used the WHO's STEPwise approach for collecting, analysing and disseminating data related to NCD in WHO countries. We searched for the WHO reports of the five countries of Maghreb on the WHO website (3). WHO reports from four countries (Morocco, Algeria, Libya and Mauritania) were available. As for Tunisia, after researching the MEDLINE/ PubMed database we found a cross-sectional descriptive study using a similar approach.

The STEPwise approach is divided into 3 "steps" for risk factors assessment (box 1). For each report, we searched for behavioural risk factors (tobacco use, alcohol intake, physical inactivity and low intake of fruits and vegetables), physical risk factors (overweight or obesity and high blood pressure) and biological risk factors (diabetes mellitus and

high levels of blood lipids). While analysing the results, prevalence of the different risk factors and their distribution across countries were the main focus of this study.

Inclusion criteria: We included studies and reports that were published by the WHO or followed the WHO's STEPwise approach. Only articles related to the countries of Maghreb were included (Tunisia, Morocco, Algeria, Mauritania and Libya). The most recent report was selected for each country.

Box1: Methodology of the WHO's STEPwise approach
(5)

Step 1: consists of gathering demographical and behavioural information via a questionnaire in a household setting. The data collected consist of socio-demographic information, data about tobacco and alcohol use, dietary behaviours, physical activity, history of NCDs and cervical cancer screening. Current Tobacco users were defined as those who smoked in the last thirty days before the study conducted. Daily users were defined as those who smoke daily during the last thirty days, while ex-smokers were defined as those who smoked in the past. Current alcohol consumption was defined as the consumption of alcohol in the last thirty days, while those who consumed alcohol in the last year were defined as those who consumed alcohol in the last twelve months. High-risk alcohol consumers were those who consumed in one occasion more than 60gr and 40gr of alcohol in the last thirty days for men and women respectively. Intermediate risk consumers are those that consumed between 40-59.9gr of alcohol of men, and 20-39.9gr for women. Low risk consumers are those who consumed less than 40 and 20gr of alcohol for men and women respectively. Physical activity levels were classified as per the WHO recommendations. Limited physical activity was defined by the absence of all criteria (1) an intense physical activity for at least 20 minutes, at least 3 days a week; (2) moderate physical activity or walking for at least 30 minutes, for at least 5 days a week; (3) physical activity for 5 days a week, for at least a total of 600 metabolic-equivalent minutes.

Step 2: consists of physical measurements in a household setting in order to determine whether the subject is overweight and if he has a raised blood pressure. Height and weight were measured using a measuring rod and a weigh scale. Body Mass Index (BMI) was considered normal between 18.5-24.9Kg/m², Overweight was defined as a BMI between 25 and 29.9 Kg/m². Obesity was defined as BMI \geq 30Kg/m². Hip and waist circumferences were measured using a measuring tape. Blood pressure (BP) was measured using an electronic BP monitor after averaging three measures. Hypertension was defined as a systolic BP \geq 140mmHg and/or a diastolic BP \geq 90 mmHg, or receiving anti-hypertension treatment.

Step 3: consists of taking a urine and blood sample from each participant in order to measure the prevalence of high urinary sodium concentration, raised Fasting Blood Glucose (FBG) and abnormal lipid levels. Capillary blood samples were collected to measure FBG and lipid levels in Morocco and Tunisia, while blood sample were drawn and analysed in the study conducted in Mauritania using enzymatic methods. Glucose metabolism impairment was heterogeneously defined across studies. Type 2 Diabetes mellitus was defined per the criteria of WHO published in 1999 as either fasting capillary glucose \geq 6.1 mmol/L, confirmed medication usage from the medication inventory or self-reported use of antidiabetic medications within the past 2 weeks of the examination or by venous FBG \geq 126mg/dl

RESULTS

We selected five full text articles, one for each country of the Maghreb. All studies were cross-sectional descriptive studies. The characteristics of the population for each study are summarized in table 1. All studies but the one conducted In Mauritania was nationwide studies. Table 2 summarizes risk factors for each report and country.

Behavioural risk factors:

Tobacco use was frequent in all five studies, with prevalence up to 29.4% (28.3-30.4) in Tunisia. Alcohol use was most prevalent in Algeria, with a prevalence of 4.1% (3.0-5.2). However, response rate especially among women was low. High levels of physical inactivity were observed, as 50.6% of the population studied in Mauritania were found to have limited physical activity. Mean consumption of

Table 1. List and summary of the included reports tackling cardiovascular risk factor

Country	Duration of study	Type of study	Study Participants	Sample size	Response Rate (%)
Algeria (19)	November 2016 to Mai 2017	Cross-sectional	Male and female aged between 18 and 69 years	7450	93,8
Morocco (20)	March 2018 to May 2018	Cross sectional	Male and Female aged 18 years or older	6100	89
Mauritania (21)	January 2006 to June 2006	Cross sectional	Male and female subjects aged between 15 and 64 years*	2600	100
Libya (22)	October 2006 to November 2007	Cross sectional	Male and female subjects aged between 25 and 69 years	4914	73
Tunisia (15)	April 2004 to September 2005	Cross sectional	Male and female subjects aged between 35 and 74 years	8007	**

*living in Nouakchott **7780 subjects were selected after excluding subjects with cardiovascular diseases and cancers

Table 2A. Prevalence and characteristics of distribution of behavioural cardiovascular risk factors

		Morocco	Algeria	Tunisia*	Mauritania	Libya
- Tobacco use	Global prevalence % (CI)	13.4 (12.2-14.6)	16.5 (15.3-17.6)	29.4(28.3–30.4)	17.8	25.1 (23.2-27.1)
	Higher classes of consumers	Aged from 30 to 44 and 45 to 59 years	Men:32.2% (30.2-34.3) vs 0.4% (0.2-0.7)	Men: 55.4 % (53.7–57.0%) vs. 4% (3.4–4.6%) Men with less education vs Women with higher education	Aged between 25 and 34 years	Aged between 25 and 35 years Men: 49.9% (46.3-52.9) vs 0.7% (0.2-1.3)
	Mean daily consumption (cigarettes/day) % (CI)	13.2 (12.1-14.1)	15 (14.2-15.7)	-	2.1 High consumption of traditional tobacco (Moneyja)	16.9 (16.0-17.8)
-Alcohol consumption	Prevalence % (CI)	1.7 (1.2-2.3)	4.1 (3.0-5.2)	-	-	1.1 (0.6-1.7)
-Insufficient Physical inactivity *	Prevalence % (CI)	21.1 (19.9-22.3)	23.3 (21.7-25.7)	-	50.6	43.7 (40.1-47.7)
	Less active classes	Women : 26% (24.4-27.5) vs 16.1% (14.3-17.8) Urban habitants 24.9% (23.3-26.6) vs 14.2% (12.6-15.9)	Women: 33.7% (30.7-36.7) vs 13.7% (12.5-15.5)	-	Women:52.9% vs 47.5%	Women: 51.7% (46.6-56.8) vs 36% (32.2-39.8)
-Low consumption of fruits and vegetables	Mean daily consumption of fruits (ration/day) (CI)	1 (1.0-1.1)	0.9 (0.9-1.0)	-	0.7	0.6 (0.5-0.6)
	Mean daily consumption of vegetables (ration/day) (CI)	2.5 (2.4-2.5)	2.1 (1.9-2.3)	-	1.9	1.2 (1.1-1.3)

Table 2B. Prevalence and characteristics of distribution of physical cardiovascular risk factors

		Morocco	Algeria	Tunisia*		Mauritania	Libya
				Men	Women		
- Hypertension	Prevalence % (CI)		23.6 (22.2-25.0)	-		22.4	40.6 (37.5-43.8)
	Mean SBP / DBP (mmHg)	129 (128.5-129.6) / 77.8 (77.5-78.1)	126.3 (125.6-127) / 75.1 (74.7-75.6)	137.0 ±22.91 (age : 65-74 years)	142.8±22.6	123.8/76.4	132.9 (131.9-133.9)/ 79.3 (78.7-79.9)
	Classes with higher prevalence % (CI)	Women: 29.8 (28.3-31.4) vs 28.7 (26.5-30.9)	Women: 24.1 (22.4-25.7) vs 23.1 (21.3-24.9)	-		Women (23.8 vs 20.6)	Men: 45.8 (42.0-49.6) vs 35.6 (31.8- 39.3)
	Classes with higher SBP	Women in rural settings	Men: 127.7 (126.9-128.5) vs 125.0 (124.1-125.8)	Women Age between 65 and 74 years		Men	Men: 136.3 (135.1-137.5) vs 129 (128.2-130.9)
	Classes with higher DBP	Women Women in rural settings	Women: 75.4 (74.8-75.9) vs 75.9 (74.3-75.4)	-		Women	Men: 80.2 (79.4-81.0) vs 78.4 (77.6-79.1)
	Subjects with untreated and high SBP and/or DBP % (CI)	71.4 (69.1-73.7)	71.9 (69.4-74.4)	-		-	59.7 (54.9-64.4)
-Overweight and obesity	Prevalence of overweight % (CI)	31.0 (31.6-34.4)	55.6 (53.9-57.2) **	-	-	25.7	33.0 (30.7-35.2)
	Prevalence of obesity % (CI)	20.0 (18.9-21.1)	21.8 (20.5-23.1)	-	-	20.9	30.5 (28.3-32.7)
	Mean BMI (Kg/m²)	25.9 (25.7-26.0)	26.4 (26.2-26.5)	25.4±4.4	28.5 ±5.5	25.5	27.7 (27.3-28.0)
	Classes with higher prevalence of obesity (CI)	Women: 29.0% (27.4-30.6) vs 11.0 (9.5-12.6)	Women: 30.1 (28.3-31.9) vs 14.1 (12.7-15.5)	-	-	Women: 31.5 vs 8.6	Women: 40.1 (37.0-43.3) vs 21.4 (19.0-23.8)
	Classes with higher mean BMI (Kg/m²) (CI)	Women: 27.3 (27.1-27.5) vs 24.4 (24.2-24.7)	Women: 27.5 (27.5-27.8) vs 25.3 (25.1-25.5)	Urban habitants: 29.4±5.3 vs 26.7±5.3	Urban habitants: 25.9±4.4 vs 24.4±4.2	Women: 27.2 vs 23.6	Women: 29.0 (28.5-29.5) vs 26.4 (26.0-26.8)

BMI: Body Mass Index

* Results in Tunisia were reported in different age and gender groups

** Total prevalence of BMI ≥25Kg/m²

Table 2C. Prevalence and characteristics of distribution of biological cardiovascular risk factors

		Morocco	Algeria	Tunisia*		Mauritania	Libya
				Men	Women		
- Hyperglycaemia and DM	Mean FBG (mg/dl)	101.4 (100.3-102.5)	98 (96.7-993)	-	-	89.1	83.5 (78.3-88.7)
	Prevalence of pre-diabetes % (CI)	10.4 (9.4-11.3)	8.2 (7.1-9.3)	-	-	3.6	7.3 (5.7-8.8)
	Prevalence of DM % (CI)*	10.6 (9.7-11.6)	14.4 (12.6-16.3)	Between 10.6 (9.0-12.3) and 22.8 (18.5-27.3%)	Between 8.0% (6.7-9.3%) and 25.6% (21.6-29.9%)	6	16.4 (14.0-18.7)
-Abnormal lipid levels	Mean blood cholesterol (mg/dl)	139.3 mg/dl (138.0-140.6)	162.9 (161.3-164.4)	-	-	170.2	174.4 (172.4-176.3)
	Prevalence of elevated cholesterol levels % (CI) **	10.5% (9.6-11.4)	24 (22.5-25.5)	-	-	14.8	20.9 (18.8-23.0)

DM: Diabetes Mellitus FBG: Fasting blood glucose

IFG: Impaired fasting glucose

* Results in Tunisia were reported in different age and gender groups

** Elevated cholesterol levels were defined as ≥ 190 mg/dl in Morocco, Algeria and Libya, and as ≥ 200 mg/dl in Mauritania

fruits and vegetables was low, and was lowest in Libya at 0.6 (0.5-0.6) rations and 1.2 (1.1-1.2) ration of fruit and vegetables daily, respectively. Only one study searched for excessive salt consumption in Morocco, and showed that 13.5% of the population added salt to their plates.

Physical risk factor

High blood pressure was frequent across all studies, with the maximal prevalence observed in Libya at 40.6% (37.5-43.8). High levels of obesity and overweight were also found in all studies, with a maximal BMI and prevalence of obesity of 27.7 Kg/m² (27.3-28) and 30.5% (28.3-32.7), respectively, also in Libya.

Biological risk factors:

Fasting Blood Glucose (FBG) was collected in all five studies. Prevalence of Impaired Fasting Glucose (IFG) and Diabetes Mellitus (DM) were high. In Libya, prevalence of DM was at 16.4% (14.1-19.7). Furthermore, analysing the levels of blood lipids in all studies showed that impaired blood lipids levels were frequent, with the highest prevalence of hypercholesterolemia at 22.8% in Algeria.

Cardiovascular risk: The global cardiovascular risk was high in all studies. Up to 7% of those aged between 40 and 54 years, and 12.6% of those aged between 55 and 69 years presented a global cardiovascular risk $\geq 30\%$ over 10 years or had cardiovascular disease in Algeria. For Tunisia, the Framingham equation showed that 18.1% of the study population were at high risk. This percentage increased with age and was higher among men (28.2% vs 9.7%).

DISCUSSION

CVD are the leading cause of mortality worldwide (2),(6). CVD contributed to 41.8% (39.43-46.21) of total deaths and 17.7% (14.91-19.26) of Disability-adjusted Life Years (DALYs) in the Maghreb in 2017(7). What is more alarming is the increase in deaths and DALYs related to CVD in the Maghreb between 1990 and 2017, with an increase of 38.78% and 50.4% respectively (7). Facing these alarming figures, the "STEPwise" approach is an interesting tool to determine and analyse the prevalence of risk factors across countries. This systematic review aims to globally assess the prevalence of cardiovascular risk factors in the

Maghreb, to better plan a global healthcare related to CVD in the region.

Even though some limitations are to be noted to our review, they are not impactful on the evaluation of the global cardiovascular risk in these countries. We analysed five reports, one for each country. Even though similar approaches were used, we noted methodological differences that make it delicate to compare some results. The first issue is that the different studies were not conducted in the same time-span, with studies conducted between 2004 and 2018. In the Tunisian report, results related to BMI were presented on form of the Mean BMI compared according to gender, age, and socioeconomic status, while in the other studies, the prevalence of overweight and obesity were also reported. There were also differences in the studies related to the definition of diabetes mellitus and impaired glucose metabolism. In the Tunisian report, fasting capillary glucose was used as diagnostic criteria in line with WHO criteria of 1999, while more recent studies like the one conducted in Algeria defined DM based on venous FBG per the actual recommendations. This may be overestimating the prevalence of DM in the Tunisian study. This, however, have minimal impact on the global cardiovascular risk. Other bias inherent to the studies should be reported such as the bias of social desirability that can underestimate the prevalence of smoking and alcohol consumption among women and even among men (8).

Our systematic review revealed that all categories of cardiovascular risk factors are prevalent in all the countries of the Maghreb. In fact, we found that behavioural, physical and biological risk factors are either as prevalent or more than the global level. In fact, prevalence of smoking in Tunisia is higher than the developed countries (9). Prevalence of obesity was up to 30.5% in Libya, more than twice the global prevalence of obesity (10). This results in high levels of global cardiovascular risk. Comparable prevalence of cardiovascular risk factors were observed in neighbouring regions such as the Eastern Mediterranean countries (11). However, we observed globally lower levels of physical inactivity and obesity in our review than in the other Middle East and North-Africa (MENA) countries (12). This can largely be attributed to the difference in nutritional profile across the MENA region, namely between north-African countries and oil-rich middle east countries (12).

In this review we also noted the disparities and differences in cardiovascular risk factors profile between the countries of the Maghreb. Even though the countries of the Maghreb may share similar geographic and historic characteristics, we can distinguish two parts that seem to present different patterns of cardiovascular risk factors. First, we note the importance of tobacco use in Tunisia, Algeria and Morocco. These countries share a similar socioeconomic environment that can explain this trend. The second part is composed by Libya and Mauritania. In these countries, we found the highest prevalence of overweight, obesity and limited physical activity, these two factors being understandably intricate. This can be explained by the cultural context. In fact, many studies showed a difference in body perception depending on race, countries and ethnicities (13). Non Western women were found to be less concerned with their BMI(13). In Mauritania Almost a quarter (23%) of women reported being force fed as a child and 32% of women and 29% of men approved the continuation of this practice (14). This partially explains the higher prevalence of obesity.

Increased cardiovascular risk was found in the three studies in which it was calculated, notably in Tunisia. It increased with age in the three studies with those aged more than 55 years in Morocco and Algeria, and more than 65 years in Tunisia having the higher cardiovascular risk compared with those aged less than 55 years and 65 years (7.6% vs 3.2% in Morocco and 12.6% vs 7% in Algeria). Gender comparison showed that men before the age of 55 years in Algeria and Morocco had higher global cardiovascular risk than women Analysing cumulative risk factors showed that 62.3% of men and 52.2% of women in Libya presented with three or more risk factors.

Identifying cardiovascular risk factors and global cardiovascular risk in the Maghreb should go on par with implanting strategies to prevent and reduce cardiovascular mortality.

NCD impact has been recognised in Tunisia since the 1990s, and NCD management unit have been established in Morocco Tunisia and Algeria. Primary and secondary prevention programs, both on individual and collective level are active in Tunisia (15) The main focuses of strategies should include a healthier balanced alimentation, promoting physical activity and tobacco cessation. Such strategies must focus on primordial prevention. This

includes population information and raising awareness on behavioural risk factors, as well education and promoting a healthier lifestyle. Smoke-free legislation and raising taxes on tobacco are also implemented (16-18) and should be more rigorously applied.

Given the dynamic change of societies and in lifestyle in the countries of the Maghreb, it is imperative to conduct regular studies to assess the prevalence of CVD risk factors as well as the efficiency of the healthcare programs that are in place actually. Adapted STEPwise approach-based studies should be conducted in the Maghreb, in the same time frame, in order to better assess the cardiovascular risk levels on a regional scale. Repeating such studies will permit to evaluate the impact of different interventions across time. Strategic goals on a regional level, integrated in a worldwide strategy, should be established, and a common Cardiovascular Health promoting program can be a productive tool to reduce the global mortality of CVD in the Maghreb.

A transitional epidemiological profile is currently observed in the Maghreb. Transition between a traditional cultural context into a more urbanized and industrialised style of life results in a heterogeneous pattern of cardiovascular risk factors across these countries. Behavioural risk factors (tobacco use, physical inactivity...) are on the rise, and implementing strategies to control these factors is an inevitable step in order to reduce the burden of CVD in these countries. Political and social implication is of the essence to surpass economic and cultural obstacles to achieve WHO's objective to reduce the global burden of CVD.

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