



Effectiveness of Interventions to Reduce Coronary Heart Disease Risk

Efficacité des Interventions Pour Réduire Le Risque de Maladies du Cœur

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ABSTRACT

BACKGROUND: Coronary heart disease (CHD) is an important cause of morbidity and mortality in industrialized countries, and its incidence is increasing in the developing world. The effectiveness of interventions in developing countries has been questioned in view of the overwhelming burden of other health problems in such environments.

OBJECTIVE: To determine the effectiveness of coronary heart disease risk reduction interventions.

METHODS: The effects of lipid lowering interventions as well as dietary and lifestyle modifications on some risk factors of CHD were studied retrospectively in 47 males and 53 female patients [aged 33 to 61 years; mean age 47.20 ± 14.17 years] attending a lipid clinic in Saudi Arabia. The main outcome measures were reductions in the values of the body mass index (BMI), blood pressure, blood glucose and lipid levels, as well as absolute reductions of risk category.

RESULTS: The interventions were associated with reduced BMI by 2.75 percent (p<0.05), systolic pressure by 3.05% (p=0.12), diastolic pressure by 5.13% (p<0.05), blood glucose by 6.51% (p<0.05), total cholesterol by 16.35% (p<0.05), LDL-cholesterol by 4.81% (p<0.05) and triglyceride by 35.01% (p<0.05). HDL-cholesterol remained within the normal range before and after the interventions in all patients. Following the interventions, the absolute risk reductions in category 1 were 45.51% and 53.35%, for males and females, respectively. In category 2, the absolute risk reductions were 30.05% and 45.67%, for males and females, respectively. In category 3, the absolute risk reductions were 100% for both sexes. For the entire study population, the absolute risk reductions were 48.65% in category 1 and 38.10% in category 2, while the percentage of patients with one or no risk factor (category 3) increased by 62%.

CONCLUSION: Lipid-lowering interventions appear to be as effective in reducing CHD risk in Bisha patients as in other populations. Appreciable absolute risk reductions can be achieved within a short period of time in all patients, irrespective of their initial risk status. *WAJM* 2011; 30(3): 197–201.

Keywords: Coronary heart disease, Risk factors, reduction, Saudi's, Dyslipidaemia, Hypertension, Body Mass Index

RÉSUMÉ

CONTEXTE: Les maladies coronariennes (CHD) est une cause importante de morbidité et de mortalité dans les pays industrialisés, et son incidence est en augmentation dans le monde en développement. L'efficacité des interventions dans les pays en développement a été contestée en raison du fardeau écrasant de problèmes de santé dans de tels environnements.

OBJECTIF: Déterminer l'efficacité des interventions coronariennes maladies du cœur de réduction des risques.

MÉTHODES: Les effets des interventions hypolipémiants ainsi que les modifications alimentaires et de mode de vie sur certains facteurs de risque de maladie coronarienne ont été étudiés rétrospectivement dans 47 mâles et 53 patients de sexe féminin [âgés de 33 à 61 ans; âge moyen 47,20 ± 14,17 années] fréquentant une clinique de lipides dans Arabie saoudite. Les principales mesures des résultats ont été des réductions dans les valeurs de l'indice de masse corporelle (IMC), la pression artérielle, la glycémie et les taux de lipides, ainsi que des réductions absolues de la catégorie de risque.

RÉSULTATS: Les interventions ont été associés à une réduction de 2,75 pour cent IMC (p < 0,05), la pression systolique de 3,05% (p = 0,12), la pression diastolique de 5,13% (p < 0,05), la glycémie par les 6,51% (p < 0,05), le cholestérol total de 16,35% (p < 0,05), le LDL-cholestérol par 4,81% (p < 0,05) et de triglycérides par 35,01% (p < 0,05). HDL-cholestérol est resté dans la fourchette normale, avant et après les interventions de tous les patients. Après les interventions, les réductions du risque absolu dans la catégorie 1 ont été 45,51% et 53,35%, pour les mâles et les femelles, respectivement. En catégorie 2, les réductions du risque absolu étaient 30,05% et 45,67%, pour les mâles et les femelles, respectivement. Dans la catégorie 3, les réductions du risque absolu était de 100% pour les deux sexes. Pour la population étudiée, la réduction absolue du risque ont été 48,65% en catégorie 1 et 38,10% en catégorie 2, tandis que le pourcentage de patients avec un ou aucun facteur de risque (catégorie 3) a augmenté de 62%.

CONCLUSION: hypolipémiants interventions semblent être aussi efficaces dans la réduction de risque de maladie coronarienne chez les patients Bisha comme dans d'autres populations. Appréciable réductions du risque absolu peut être réalisé dans un court laps de temps chez tous les patients, indépendamment de leur statut risque initial. *WAJM* 2011; 30(3): 197–201.

Mots-clés: maladie coronarienne, facteurs de risque, la réduction, saoudien, la dyslipidémie, l'hypertension artérielle, indice de masse corporelle

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Abbreviations: ATP III, Adult Treatment Panel III; BMI, Body Mass Index; CHD, Coronary heart disease; HDL, High density lipoprotein; LDL, low density lipoprotein.

INTRODUCTION

Coronary heart disease (CHD) is an important cause of morbidity and mortality in industrialized countries, and its incidence is increasing in the developing world.¹ Furthermore, the prevalence of CHD has a socio-economic effect because the cost impact on health care system is enormous.² This is an extra strain for developing countries with numerous health problems. Nevertheless, CHD is a preventable disease and it has been shown that clinical intervention could abort the course of the disease at any stage.³ The first step towards prevention and management is the identification and assessment of the risk factors which include age ≥ 45 years for men or ≥ 55 years for women, blood pressure $\geq 140/90$,³ hypercholesterolemia, hypertriglyceridemia and low high density lipoprotein cholesterol. The risk that is attributed to diabetes mellitus is recognized as equivalent to that of CHD.⁴

The third report of the Expert panel on the detection, evaluation and treatment of high blood cholesterol in adults [ATP III (Adult Treatment Panel III)] which was published in 2001,

focused on the prevention of CHD and recommended a lowering of low-density lipoprotein cholesterol (LDL-C) as the primary target of cholesterol lowering therapy.⁴ Furthermore, the report categorized individuals into 3 risk groups as follows: (a) category I or the high-risk group includes individuals with CHD and CHD equivalent; 30 percent or more, of the people in this group will probably develop CHD within 10 years, (b) category 2 or moderate risk group includes those with multiple (2+) risk factors; 20 percent or more, of the people in this group will probably develop CHD within 10 years, and (c) category 3 or low risk group consists of individuals with 0-1 risk factor; 10 percent or more, of the people in this group will probably develop CHD within 10 years.⁴

The effectiveness of interventions to prevent CHD in developing countries has been in doubt in view of the overwhelming health burden in these environments.² We therefore, studied the effectiveness of the ATP III recommendations for lipid lowering interventions to reduce CHD risk among the patients attending the Lipid Clinic at King

Abdullah Hospital (KAH), Bisha.

SUBJECTS, MATERIALS, AND METHODS

A retrospective analysis of the biodata of 100 consecutive patients consisting of 47 males and 53 females aged 33 to 61 years (mean age 47.20 ± 14.17 years), attending the Lipid Clinic for dyslipidaemias and obesity at KAH, Bisha, between January 1 and June 30, 2005, a period of six months, was carried out. All the patients were referred from Primary Health Centres in the Bisha area. At the initial visit to the clinic, the family, drug, past medical and habitual dietary histories were obtained, followed by a general clinical examination with emphasis on the height, weight, and blood pressure. In addition, the patients were advised on the benefits of low fat and low carbohydrate diets as well as regular physical exercises. They were provided with diet sheets containing examples of diet regimens to guide their choice of meals. They were also referred to the physiotherapy department for participation in weight reducing exercises. Laboratory investigations for

Table 1: Effectiveness of Lipid Reduction Therapy in Male and Female Subjects

Risk Factor	Reference Ranges	Mean \pm SD Reduction (%)					
		Male (47)		Female (53)		Both (100)	
		Before	After	Before	After	Before	After
Fasting Glucose % Reduction	3.6–6.7	9.49 \pm 1.69	8.23 \pm 3.11* 13.28	7.41 \pm 3.35	7.27 \pm 3.19	8.29 \pm 3.96	7.75 \pm 3.17* 6.51
Cholesterol % Reduction	1.3–6.2	6.22 \pm 1.69	4.80 \pm 1.24* 22.83	5.43 \pm 1.41	4.92 \pm 1.23* 9.39	5.81 \pm 1.59	4.86 \pm 1.22* 16.35
LDL-Cholesterol % Reduction	2.5–3.3	3.14 \pm 1.13	2.99 \pm 1.08* 4.78	3.12 \pm 1.25	2.97 \pm 1.1* 4.81	3.12 \pm 1.19	2.97 \pm 1.13* 4.81
HDL-Cholesterol % Reduction	0.9–1.4	1.07 \pm 0.30	0.93 \pm 0.3 [†] 13.08	1.24 \pm 0.31	1.13 \pm 0.35 [†] 8.87	1.17 \pm 0.31	1.04 \pm 0.34 ^{††} 11.11
Triglyceride % Reduction	0.3–1.5	3.92 \pm 3.01	2.14 \pm 1.55* 45.41	2.92 \pm 2.31	2.24 \pm 2.07* 23.29	3.37 \pm 2.68	2.19 \pm 1.84* 35.01
BMI % Reduction	>30	31.49 \pm 5.16	30.97 \pm 5.31* 1.65	32.61 \pm 6.30	31.00 \pm 5.84* 4.94	31.83 \pm 5.95	30.98 \pm 5.56* 3.05
Systolic Pressure(mmHg) % Reduction	140	128.51 \pm 29.69	122.88 \pm 20.34 [†] 4.43	135.68 \pm 19.72	128.00 \pm 21.85 [†] 1.82	132.01 \pm 25.48	127.99 \pm 21.85 [†] 3.05
Diastolic Pressure (mmHg) % Reduction	90	82.09 \pm 11.22	78.97 \pm 10.01 [†] 3.80	80.91 \pm 10.51	77.33 \pm 13.01 [†] 6.45	81.51 \pm 0.87	77.33 \pm 13.01* 5.13

* P < 0.05; [†] P > 0.05.

Table 2: Coronary Heart Disease Risk Reduction in Male and Female

Risk Category Sex (Number)	Before	After	Before	After	Before	After
	Male(47)		Female(53)		Both (100)	
1. ($\geq 30\%$) % absolute risk reduction	46.8	25.5	28.3	13.2	37.0	19.0
		45.51		53.36		48.65
2. ($\geq 20\%$) % absolute risk reduction	21.3	14.9	20.8	11.3	21.0	13.0
		30.05		45.67		38.10
3. ($\geq 10\%$)	31.9	59.6	50.9	75.5	42.0	68.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

fasting glucose and lipid profile were ordered for the next clinic visit scheduled for four weeks.

Results of the lipid profile and other risk factors were used to assess the risk status of the patients. Thereafter, patients received treatment according to their risk categories.⁴ Treatment included life-style changes such as intake of low fat and carbohydrate diet, participation in regular exercises, cessation of cigarette smoking and the use of lipid lowering drugs (simvastatin 10mg daily for hypercholesterolemia and gemfibrozil 600mg daily for hypertriglyceridemia, as starting doses; the doses were subsequently increased when necessary). The risk status assessment was repeated after six months of therapy.

Statistical Analysis

Using the SPSS 10.0 software, the mean values for age, fasting blood glucose, cholesterol, low density cholesterol, high density cholesterol, triglyceride, body mass index (BMI), as well as the systolic and diastolic blood pressures, were analyzed. Paired samples student's t test was applied and the significance of differences between pre-therapy and post-therapy values as well as percentage reductions in the risk values was determined. P value less than 0.05 was considered to be significant.

RESULTS

The age range of the patients was 33 to 61 years (mean age 47.20 ± 14.17 years). Table 1 shows that before the interventions, all the patients were hyperlipidaemic and hyperglycaemic. Thus, the means of their initial fasting

total cholesterol, LDL-cholesterol, triglyceride and fasting glucose were above the normal reference values. Conversely, their mean HDL-cholesterol value was within the normal range. The initial values of the body mass index (BMI) were above 30 in all the patients, reflecting the high prevalence of obesity/overweight in the study population. Furthermore, the means of the initial systolic and diastolic blood pressures were below 140 and 90mm Hg, respectively.

Following therapy, there were general reductions in the values of the measured risk factors. Thus, significant reductions in the mean total cholesterol, LDL-cholesterol, triglyceride, fasting glucose and BMI values were achieved ($p < 0.05$). Also, there were reductions in the HDL-cholesterol, mean systolic pressures of both male and female patients, and mean diastolic pressure of male patients, although the reductions were not statistically significant ($p > 0.05$). However, statistically significant reductions were achieved in the mean diastolic pressures of the female patients and the study population as a whole ($p < 0.05$).

In Table 2, the patients are grouped into different risk categories. Appreciable reductions in absolute risks were achieved for categories 1 and 2 patients (48.65 percent and 38.10 percent, respectively), while the number of patients in category 3 increased by 62 percent.

DISCUSSION

The patients studied were in their middle ages. People in this age group

are particularly at high risk for coronary heart disease (CHD). Hence, they are often targeted for CHD prevention. The initial mean values of total cholesterol, LDL-cholesterol, triglyceride and fasting glucose of the patients were greater than the normal ranges. Despite the normal mean HDL-cholesterol value, the implication of these results is that the patients were at high risk of developing coronary heart disease because of the presence of other risk factors. Therefore, there was a need for an effective management of their hyperlipidemic state. Indeed, it has been reported that cholesterol concentrations exceeding 3.8mmol/L account for the development of 55 percent of ischemic heart diseases.² Therapy with the prescribed dietary regimens, increased regular physical exercise and lipid lowering drugs resulted in significant reductions of the levels of the risk factors. These results are comparable to those reported by others.⁵⁻⁷ The reductions in the mean HDL-cholesterol levels could be due to low fat diet which the patients were taking. Diets that are restricted in fat have been reported to lower HDL-cholesterol.⁸ In addition, low HDL-cholesterol was reported to be an adverse effect of using statins.⁸

The initial mean blood glucose level and its subsequent reduction among the male patients were higher than those of female patients. This might be because there were more male diabetics resulting in a higher mean glucose level. The effect of hypoglycaemic agents, which they were using, could have caused a greater reduction in their post-treatment mean glucose level. This is supported by the finding of Jula *et al* in non-diabetic normoglycaemic males in which the glucose levels remained unchanged after receiving similar treatment of increased physical activity, low fat diets and simvastatin.⁷ Hyperglycaemia is associated with unfavourable lipid pattern and high risk of coronary heart disease. Strict control of blood glucose levels reduces lipid levels and the risk of coronary heart disease.⁹

The patients were generally obese although the women had a higher mean BMI than the men. Overweight individuals are particularly at high risk of

coronary heart disease.¹⁰ The subsequent reduction in the mean BMI values could have resulted from changes in the life style of the patients which involved diets, and participation in regular physical exercise. In this geographical area, female patients were at a disadvantage with respect to their participation in regular physical exercise or activity. This is due to socio-cultural constraints which limit outdoor activities for women. The more liberal outdoor life style of their male counterparts encouraged greater participation in regular physical exercises. Hence, the initial mean BMI value of male patients was lower than that of the female patients. Following the intervention, the reduction in BMI was greater in the women because the men had achieved weight normalization earlier as reported in a previous study.¹⁰

The mean blood pressure of the patients was below the ATP III risk level of 140/90mm Hg. However, they were still susceptible to CHD in view of the fact that a high incidence of cardiovascular events has been reported in subjects with normal blood pressure or mild hypertension.¹¹ Nevertheless, the reductions in blood pressures, due to adequate management of hypertensive cases, could be beneficial to the patients. The results of prospective treatment trials of mild and moderate hypertension have shown that a 5 to 6 mmHg reduction in diastolic pressure is associated with a 14 percent reduction in coronary heart disease.¹² Hypertension is recognized as one of several risk factors that determine the development of coronary heart disease.

The reductions of absolute risk of the patients were comparable to those reported in other studies. Greater reductions of absolute risks were achieved among patients with higher risk of coronary heart disease (category 1) than in patients with lower risk (category 2). These results are similar to those of other studies,¹³⁻¹⁵ and confirm the observation that people with higher risks tend to derive more benefit from interventions than those whose risks are lower. The values of absolute risk reduction were slightly higher in females than male patients. The reason might be because there were slightly more women than men in the study population.

We conclude that the lipid lowering interventions employed in this study were as effective in reducing CHD risk in our patients as in other populations studied. Furthermore, an appreciable absolute risk reduction was achieved within a short period of six months. Finally, this approach to CHD risk management was effective in all patients, irrespective of their initial risk status.

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