

## Review Article

### THE PUBLIC HEALTH BURDEN OF PHYSICAL INACTIVITY IN SAUDI ARABIA

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نظراً للتغيرات الكبيرة التي حدثت في النمط المعيشي لأفراد المجتمع السعودي في العقود الثلاثة الماضية، فقد ازدادت عوامل الخطورة المهيأة للإصابة بأمراض القلب التاجية بصورة كبيرة في المملكة العربية السعودية. وغني عن القول أن الخمول البدني الذي انتشر بشكل كبير في المجتمع يمثل عاملاً من العوامل الرئيسة المهيأة للإصابة بالعديد من الأمراض المزمنة. هذه المقالة تستعرض أهمية النشاط البدني كوسيلة لتعزيز صحة المجتمع ووقايته من العديد من الأمراض المزمنة، كما تناقش التبعات الصحية الناجمة عن الخمول البدني في المملكة العربية السعودية. تشير الدلائل المتوافرة لنا حالياً إلى أن الخمول البدني يعد شائعاً بين أفراد المجتمع السعودي بنسب تتراوح من 60% إلى 80% وقد تصل إلى 99%، تبعاً لبعض الدراسات المحدودة. إن معدل الخطورة السكانية الناجمة عن الخمول البدني في المملكة العربية السعودية تعد عالية جداً، وتفوق مثيلاتها في الولايات المتحدة الأمريكية وبريطانيا. إن من المعروف أن للنشاط البدني فوائد صحية عديدة، وهو يسهم في الحد من عوامل الخطورة المهيأة للإصابة بالأمراض القلبية، وبالتالي فإذا لم يتم خفض نسبة الخمول البدني في المجتمع السعودي، فإن الكلفة الصحية العامة ستكون عالية في المستقبل. أخيراً، لقد ناقشنا عدداً من التوصيات الكفيلة بالحد من الخمول البدني في المجتمع السعودي وتقديم بعض المقترحات التي تهدف لتعزيز الحياة النشطة.

**الكلمات المرجعية:** الخمول البدني، مخاطر الإصابة بأمراض القلب، تعزيز الصحة، العبء الصحي على المجتمع، معدل الخطورة السكانية.

*Because of the enormous changes in the lifestyle of Saudis in the last three decades, the risk factors of coronary heart disease (CHD), including physical inactivity, are increasingly becoming prevalent in the society. This paper provides an overview of the importance of physical activity in health promotion and disease prevention, and discusses the public health burden of physical inactivity in Saudi Arabia. Available evidence clearly indicates that physical inactivity is extremely prevalent in the different ages and sex of the Saudi population. This high prevalence of inactivity in Saudi society presents a major public health burden, as evidenced by the high risk in the Saudi population as a risk of physical inactivity compared with the populations of United States and the United Kingdom. Unless concrete steps are taken to reduce physical inactivity in the Saudi population, the future public health cost would be enormous. It is well known that physical activity is associated with numerous health benefits and plays a major role in modifying many other CHD risk factors. Finally, several recommendations for reducing physical inactivity and promoting active life in the Saudi population have been discussed.*

**Key Words:** Physical inactivity, coronary risk factors, health promotion, public health burden, population attributable risk, Saudi Arabia.

#### INTRODUCTION

Cardiovascular diseases (CVD) are becoming the major cause of mortality in developing countries.<sup>1</sup> The 2002 World Health Report indicates that the

most important risk factors for noncommunicable diseases include high blood pressure, high blood cholesterol, inadequate fruit and vegetable intake, overweight and obesity, physical inactivity and

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tobacco use.<sup>2</sup> A recent community-based national study, involving adult Saudis between the ages of 30 and 70 years, showed that the overall prevalence of coronary heart disease (CHD) in the Kingdom of Saudi Arabia is 5.5%.<sup>3</sup> However, the expected increase in mortality as a result of ischemic heart disease in the Middle East region in 2020 compared to 1990 was estimated as the highest of all the regions of the world (146% increase in women and 174% increase in men).<sup>4</sup> This is mostly attributed to the high prevalence of major CHD risk factors. The latest report involving Saudis between the ages of 30 and 70 years showed the following prevalence: 23.7% for diabetes; 26% for hypertension; 12.8% for smoking; 53.9% for hypercholesterolemia, and 35.6 for obesity.<sup>3</sup> This high prevalence of CHD risk factors in the Saudi population confirms many earlier findings on CHD risk factors involving different segments of the Saudi society.<sup>5-8</sup>

Prevention of CVD depends on controlling the modifiable risk factors, such as, physical inactivity and obesity. In fact, physical inactivity represents an independent risk factor for a number of chronic diseases, including CHD, diabetes mellitus, obesity, osteoporosis.<sup>9-11</sup> However, physical activity has been shown to both prevent and treat many established atherosclerotic risk factors.<sup>10,12-14</sup> The World Health Organization (WHO), which has long recognized the heavy burden of noncommunicable diseases on the health services, recently launched its global strategy on diet, physical activity and health.<sup>15</sup> The overall goal of the strategy is to improve public health through healthy eating and physical activity. This concerted effort on the part of WHO to improve global public health through physical activity is a continuation of previous actions taken during the last decade by numerous health and medical organizations, including the American Heart Association,<sup>9,16</sup> the American College of Sports Medicine,<sup>13,17,18</sup> and Centers for Disease Control and Prevention.<sup>11,19</sup>

The present paper, therefore, provides an overview of the importance of physical activity in health promotion and disease prevention, and discusses the public health burden of physical inactivity. It is also the aim of this paper to briefly review the status of physical inactivity in Saudi Arabia and to calculate the attributable risk of physical inactivity in the Saudi population. In addition, some preliminary findings from the longitudinal study on physical activity and cardiovascular health of the Saudi youth will be presented throughout this paper.

## PHYSICAL ACTIVITY: AN IMPORTANT PUBLIC HEALTH ISSUE

Physical activity is defined as any bodily movement produced by the skeletal muscles that results in energy expenditure above the basal level.<sup>20</sup> Physical activity is considered a complex set of behaviors. Our ability to relate physical activity to health indicators depends on accurate, precise and dependable measures. Physical activity is commonly measured by either self-report or direct monitoring through mechanical/electronic or physiological measurements. Table 1 presents an important distinction between the definitions of physical activity and physical fitness. It also shows the meaning of metabolic equivalent (MET), which is increasingly becoming a very common term for quantifying the intensity of physical activity or energy expenditure, especially for the purpose of exercise prescription or physical activity assessment.

**Table 1:** Definitions of basic terms

Physical Activity: Any bodily movement that is produced by the skeletal muscles and results in energy expenditure above the basal level.\*

Physical Fitness: A set of attributes that people have or achieve that relate to the ability to perform physical activity.\*

Metabolic Equivalent (MET): A unit used to estimate the metabolic cost of physical activity. One MET equals the resting metabolic rate of approximately 3.5 ml O<sub>2</sub> kg<sup>-1</sup> min<sup>-1</sup> or one kilocalorie per kg of body weight per hour.

\*From reference 20

Today, it is estimated that 60-85% of adults around the world are simply not active enough to achieve the health benefits of physical activity.<sup>21</sup> To deal with this epidemic of physical inactivity, WHO has recently established the Physical Activity Unit as part of the Department of Noncommunicable Disease Prevention and Health Promotion.<sup>22</sup> The goal of this unit is to promote higher levels of physical activity within the world population of all ages and conditions, men and women. The unit's strategic products include: (1) Developing a global strategy and database on physical activity; (2) Promoting the annual global *Move for Health* initiative; (3) Supporting a country's actions and facilitating the development of multisectorial national policies and programmes on physical activity; and (4) Developing partnership and networks for increasing population participation in physical activity with a special focus on young people.

Despite the fact that most medical institutions currently do not provide their graduates with the proper training and necessary skills in physical activity assessments and exercise prescription,<sup>23</sup> many medical organizations are now urging health care professionals to provide counseling on physical activity for their patients. The American Heart Association (AHA) for example, stated in its recent guidelines for the primary prevention of CVD and stroke, that the assessment of the risk factors in adults should commence at 20 years of age. Physical activity is a primary CHD risk factor, and should be assessed at every routine evaluation.<sup>24</sup> The AHA goes further in its recommendations and asks that: (a) Schools should be encouraged to teach skills required for physically active lifestyle; (b) health care professionals should be educated about exercise as a therapeutic modality, and the importance of lifelong physical activity for patients; (c) they should routinely prescribe exercise for their patients; and (d) exercise testing should be performed before vigorous exercise in selected patients with CVD or those at high risk.<sup>24</sup>

Furthermore, the importance of physical activity in health promotion and disease prevention strategy was evident in the "Healthy People 2010" report, published by the Centers for Disease Control and Prevention (CDC) of the United States Department of Health and Human Services.<sup>25</sup> In that report, 10 leading health indicators (LHI) were identified. The LHI reflect the major public health concerns in the United States, and highlight the importance of health promotion and disease prevention on the societal level. Physical activity, not surprisingly, is the first on the list of LHI, followed by obesity in the Healthy People 2010 report. Among the target goals for the Healthy People 2010 was an increase in the proportion of adults and adolescents who engage in moderate physical activity (3-6 METs) for at least 30 minutes on five or more days per week.

### THE PREVALENCE OF PHYSICAL INACTIVITY IN SAUDI ARABIA

During the past three decades, the Kingdom of Saudi Arabia has undergone tremendous changes in lifestyle, including physical activity and eating habits. These dramatic lifestyle changes have definitely had a considerable negative impact on the health of the society. Indeed, this lifestyle transformation is thought to be responsible for the epidemic of noncommunicable diseases and their complications in the country.<sup>3,26,27</sup> Unfortunately,

there exists no physical activity surveillance system in the country. However, mere observation indicates that there is a reduction in daily physical activity and energy expenditure of the Saudi people relative to earlier times. Moreover, findings from a limited number of studies on the prevalence of physical inactivity in Saudi population confirm that a sedentary life style is on the rise.<sup>26,28,29</sup> Across all segments of the Saudi population, physical inactivity ranged from 43% to 99%, depending on gender, age, location, and target population.<sup>30</sup> Figure 1 presents some data for physical inactivity among Saudi children, youth and adults, conducted on samples from Riyadh.<sup>29,31,32</sup> In the studies conducted on children<sup>26,31</sup> and youth,<sup>32</sup> continuous 12-hour heart rate telemetry was used to measure physical activity. In the adult study,<sup>29</sup> a self-reporting questionnaire was utilized for physical activity assessment. The overall prevalence rates of physical inactivity among Saudi children, youth and adults were roughly 60%, 70%, and 80%, respectively. The prevalence rates for inactivity among Saudis, shown in Figure 1, agree with those estimates reported worldwide by WHO.<sup>21</sup>

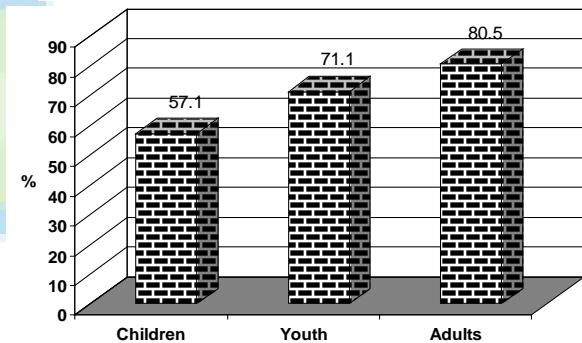


Figure 1: Prevalence of physical inactivity in Saudi children, youth and adults.

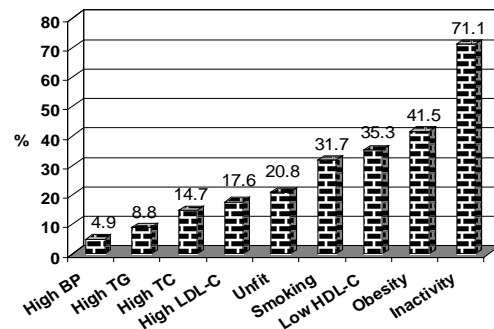


Figure 2: Prevalence of coronary heart disease (CHD) risk factors among a sample of Saudi youth

It is quite clear from the data presented in Figure 1 that physical inactivity is prevalent among Saudi children and youth. Findings from a recent study on 12-20-year-old schoolboys living in Riyadh have also shown inactivity prevalence of about 50%.<sup>33</sup> Promoting physical activity among children and adolescents is very important in order to offset any decline in their activity level as they grow-up. Data from several countries indicated a decline in physical activity among the youth starting at age 12 and continuing up to 20 years.<sup>34, 35</sup> Preliminary findings from our own longitudinal study on Saudi youth showed a 30% increase in physical inactivity from childhood (7-12 years) to early adulthood (18-23 years). This was coupled with a three-fold increase in television viewing during the same period of time.<sup>36</sup> Data from our laboratory<sup>32, 36</sup> also demonstrated that inactivity prevalence in youth is far more pronounced than any of the other CHD risk factors, as shown in Figure 2. Therefore, a reduction in the prevalence of physical inactivity among Saudi youth would have a far greater impact on risk reduction than a reduction in any of the other traditional CHD risk factors. Efforts to promote physical activity among the youth depend mainly on health care providers. The council on cardiovascular disease in the youth of the AHA has issued a statement for health professionals asking them to counsel their young patients on physical activity, including physical activity assessment and exercise prescription.<sup>37</sup> Therefore, routine counseling by local physicians on physical activity and the health of their young patients should be initiated.

#### **THE PUBLIC HEALTH BURDEN OF PHYSICAL INACTIVITY**

The burden of mortality, morbidity and disability attributable to noncommunicable diseases, including sedentary life, is considerably high and continuing to grow.<sup>15</sup> According to preliminary data from a WHO study on risk factors, inactivity is one of the 10 leading global causes of death and disability.<sup>21</sup> Worldwide, physical inactivity was estimated to cause 1.9 million deaths and 19 million disability-adjusted life years.<sup>2</sup> Physical inactivity was also estimated to globally cause about 22% of ischemic heart disease and about 10-16% of cases each of diabetes mellitus, breast, colon and rectal cancer.<sup>2</sup> Research on the epidemiology of physical activity revealed that it appears to be a far more important risk factor than previously estimated.<sup>38-40</sup> Quantitative estimates from the United States

indicated that sedentary life is responsible for 35% of CHD deaths, 32% of deaths from colon cancer and 35% of deaths from diabetes.<sup>41</sup> Furthermore, inactivity-related disease in the United States causes over 14 times more deaths annually than acquired immune deficiency syndrome (AIDS).<sup>42</sup>

In Saudi Arabia, the prevalence of physical inactivity is extremely high, especially in women, and may be considered among the highest in the world.<sup>30</sup> Recent local data also showed a high prevalence of other CHD risk factors among Saudi population.<sup>3</sup> In addition, type 2 diabetes mellitus is becoming increasingly more prevalent among Saudis.<sup>3,43</sup> Obesity has also reached epidemic proportions, especially among Saudi females.<sup>3, 44</sup> It is our own belief that strong associations do exist between the high prevalence of physical inactivity in the Saudi population and the epidemic of modern chronic diseases and risk factors in Saudi Arabia. Therefore, reducing the proportion of inactive Saudis would have a tremendous impact on lowering these lifestyle-related diseases and risk factors, and thus reduce future health care costs in the Kingdom.

#### **POPULATION ATTRIBUTABLE RISK OF PHYSICAL INACTIVITY**

Population attributable risk (PAR) is one of the more useful methods of estimating the proportion of a public health burden resulting from a particular risk factor.<sup>41</sup> PAR is the risk in total population minus the risk in the unexposed group. Thus, PAR provides an estimate of how much of a particular disease could be prevented if exposure to the risk factor was eliminated.<sup>45</sup> It can be calculated from the estimate of relative risk (RR) and the population prevalence of the risk factor. RR is used to assess the magnitude of risk of exposed individuals to a particular disease relative to unexposed individuals. However, the societal impact of exposure depends not only on the magnitude of the relative risk but also on the prevalence of the risk factor in the population.<sup>45</sup>

The concept behind PAR is to help provide a balanced view between a relatively strong risk factor that affects fewer people and a relatively weaker risk factor that is more prevalent in a population.<sup>39</sup> Figure 3 shows PAR for major CHD risk factors in the United States (USA)<sup>40</sup> and the United Kingdom (UK).<sup>46</sup> PAR for physical inactivity in the US and the UK were 35% and 37%, respectively. This means that approximately one third of CHD mortality could be attributed to physical inactivity in the US and the UK. In both

countries, physical inactivity as a contributing risk factor to CHD deaths was next in magnitude to hypercholesterolemia.

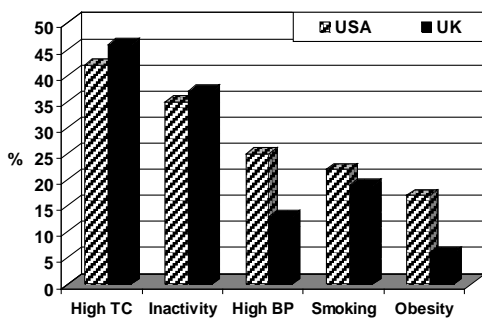
PAR of sedentary living for mortality from CHD and diabetes to the data from Saudi population were applied. The results are shown in Table 2. Physical inactivity prevalence data were taken from a recent study on Saudi adult males living in Riyadh, where there were three levels of exposure and prevalence estimates.<sup>29</sup> For relative risk, estimates that were previously reported elsewhere were used.<sup>40, 41</sup> Of course, the relative risk means the number of deaths among active population divided by the number of deaths among the inactive population. As indicated in table 2, PAR of sedentary living for mortality from CHD and diabetes in Saudi Arabia was considerably high and much greater than what is reported in Figure 3 for the UK and the USA since physical inactivity is much higher in Saudi Arabia than in the USA or in the UK.

**Table 2:** Estimated population attributable risk (PAR) of sedentary living for mortality from coronary heart disease (CHD) and diabetes mellitus in Saudi Arabia

Exposure group	Exposure Prev. * (%)	CHD		Diabetes	
		Rel. risk <sup>†</sup>	PAR	Relative risk	PAR
Sedentary	53.0	2.0	34.6	1.8	29.8
Irregularly active	27.5	1.5	12.1	1.6	14.2
Regularly active	19.5	1.0	-	1.0	-

\*Exposure prevalence: Physical activity prevalence data were from reference 29.

<sup>†</sup>Relative risk: Relative risk data were taken from reference 47.



**Figure 3:** Estimated population attributable risk (PAR) for major CHD risk factors in the USA and UK

Table 3 presents the relative risk, prevalence and PAR of some major CHD risk factors applied to the Saudi population. The relative risk data were

**Table 3:** Relative risk (RR), prevalence (%) and population attributable risk (PAR) of major coronary heart disease risk factors applied to Saudi population

Variable	Smoking	Elevated Cholesterol	High BP	Physical Inactivity
Relative risk*	2.5	2.4	2.1	2.0
Prevalence (%) <sup>†</sup>	12.8	53.9	26.0	80.5
PAR <sup>‡</sup>	15.8	43.0	22.2	44.6

\*Relative risk data were taken from reference 47

<sup>†</sup>Physical activity prevalence data were from reference 29, data from the prevalence of smoking, elevated cholesterol and high blood pressure were taken from reference 47.

<sup>‡</sup>The PAR here is slightly lower than in Table 2, because one exposure for physical activity were used here.

taken from Powell, et al.<sup>47</sup> Prevalence data for physical inactivity were taken from an earlier study on adult males in Riyadh.<sup>29</sup> The prevalence data of other CHD risk factors were from a newly published paper on Saudi adults between the ages of 30 and 70 years.<sup>3</sup> As clearly shown in Table 3, physical inactivity represents a far more important risk factor than was previously thought. This is mainly due to the high prevalence of inactivity in Saudis. Therefore, reducing the proportion of inactive Saudi adults to 40% from the current figure of 80% would definitely reduce the burden of physical inactivity on public health. In the USA, Healthy People 2010 calls for reducing to no more than 20%, the proportion of people 18 years and older who are inactive.<sup>25</sup>

### CONCLUSION AND RECOMMENDATIONS

It was clear from the available evidence that physical inactivity is becoming more prevalent in the Saudi population of different ages and both sexes. This high prevalence of inactivity in Saudi Arabia represents a major public health burden, as evidenced by the high PAR of physical inactivity, compared with those of the USA and UK. Moreover, due to the high prevalence of other CHD risk factors among Saudis, the rate of lifestyle-related diseases (CHD, diabetes, obesity, etc...) in the society may keep escalating to epidemic proportions in the near future. Unless concrete steps are taken to reduce physical inactivity in the Saudi population, the future public health cost will be heavily burdened. Physical activity is associated with numerous health benefits and plays a major role in modifying many other CHD risk factors.

The following recommendations for reducing physical inactivity and promoting active living are made:

(1) National policy and legislative initiatives are urgently needed to encourage active lifestyle and discourage sedentary living habits. This recommendation was clearly stated as an important objective in the Global Strategy on Diet and Physical Activity, launched recently by WHO.

(2) There is a need to establish a surveillance system to monitor physical activity in the Saudi population. Monitoring physical activity of the Saudi population at regular intervals would definitely provide important database. Such a database would represent a cornerstone for any programs that would aim at combating physical inactivity and promoting active living.

(3) Medical communities and health care providers must play a leading role in promoting physical activity, by providing routine assessments and counseling on physical activity and exercise prescription for their patients. This is consistent with many recent appeals from leading medical and public health organizations, such as the American Heart Association, the American Academy of Pediatrics, the American College of Sports Medicine, the Centers for Diseases Control and Prevention, and the WHO.

(4) Implementation of daily physical education for students from kindergarten to grade 12 is necessary to promote life-long physical activity among Saudis. Emphasis should be on quality curricula and instructions that help students develop the knowledge, attitudes, motor skills and confidence needed to adopt and maintain physically active lifestyles.

(5) Opportunities for physical activity should be available for a wide range of people, including the elderly, children and women. Given that walking is acceptable across sociodemographic subgroups of the Saudi population, efforts must be made to increase outdoor as well as indoor walking trails. Promoting brisk walks as a means of physical activity could markedly increase the proportion of physically active Saudis.

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