8. Special Considerations for the Middle East

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8.1. Hot Environment and Physical Activity

During exercise in hot weather conditions, if the air temperature exceeds 36 °C, the body gains heat by radiation and convection from the environment [1]. Subsequently, the blood flow through the skin and sweating increase, potentially leading to water and electrolyte imbalance, heat exhaustion, or heat stroke [2,3]. Symptoms of heat exhaustion include excessive sweating, feeling dizzy, increased heart rate, muscle cramps, nausea, and vomiting. Exercising outdoors is not recommended if temperature exceeds 39 °C (103 degrees Fahrenheit) because of risk of heat stroke. Thus, exercising indoors performed in air-conditioned facilities—e.g., in fitness centers is strongly recommended [4]. It relates particularly to individuals with cardiovascular disease.

Exercise training in hot temperature executed by sport professionals requires the implementation of adequate strategies—i.e., adequate fluid supplementation, suitable clothing, and heat acclimatization [5]. The necessary fluid replacement volume can be evaluated by body mass change—i.e., fluid intake should match sweat loss during exercise [6]. Adequate clothing—i.e., short-sleeve t-shirts, shorts, sport shoes, and head covers—is strongly recommended.

Heat acclimatization should comprise repeated exercise heat exposure over 1–2 weeks.

The first exercise sessions performed in the heat should be as short as 5–10 min, with at least a few hours of recovery between exercise bouts [7]. Heat acclimatization leads to improved sweating, improved skin blood flow, lowered body temperature, improved fluid balance, and altered metabolism [8,9]. The degree of adaptation is determined by the intensity, duration, frequency, and number of sessions of heat exposure, as well as the environmental conditions.

8.2. Physical Activity in the Middle East

Cardiovascular disease accounts for more than 45% of total mortality in the Arabian Peninsula [10,11]. The rate of physical inactivity in this region remains very high (61% and 73% for males and females, respectively). In the Kingdom of Saudi Arabia, the central country of the region, the prevalence of physical inactivity has reached a rate of 69%. Furthermore, the prevalence of obesity and diabetes

in the Saudi population has reached 49% and 25%, respectively, according to the Prospective Rural Urban Epidemiology study [12].

The two main barriers to physical exercise in the Middle East region are the hot environment and sociocultural factors [13,14]. The latter include the routine use of drivers and housemaids, the lack of adequate knowledge of the topic, the lack of motivation, and the insufficient number of exercise facilities [15]. Some obstacles relate to women specifically, as traditionally women are not expected to perform physical activity in public. Thus, it is important to develop adequate strategies to improve the physical activity rate in the Middle East region through:

- The promotion of physical activity classes at primary schools;
- The development of fitness centers—e.g., in malls;
- Physical activity promotion events supported by the government, healthcare providers, and religious leaders.

8.3. Cardiac Rehabilitation during Ramadan

Ramadan is one of the five pillars of Islam, during which Muslims are not allowed to eat or drink between sunrise and sunset. Ramadan affects Muslims' diets, levels of physical activity, sleeping patterns, and adherence to medications [16]. Decreases in physical activity may be attributed to dehydration, fasting, or disturbed sleeping cycles [16]. Therefore, to prevent functional capacity impairment, adequate hydration, and the maintenance of exercise regimens are essential. Physical activity during Ramadan should preferably be performed in air-conditioned facilities—e.g., in fitness centers. The optimal timing of exercise is debated, with it being suggested that exercise be performed before the main meal (Iftar) or at night (1–2 a.m.). Each training session should consist of a 5–10 min warm-up, a main session of 20–30 min, and 5–10 min of cool-down. Endurance training intensity should be reduced (at a light-to-moderate level) and be performed at intervals. Strength training intensity should not exceed 50% of 1-RM. Adequate fluid replacement and wearing suitable clothing are essential [17].

Adherence to cardiac rehabilitation programs during Ramadan is poor due to participants' fasting and disturbed sleep patterns. According to the authors' experiences, only 15%–20% of patients regularly attend supervised exercise sessions during Ramadan. Thus, the authors suggest the following strategies:

For patients already enrolled in exercise sessions before Ramadan, the use of a light-to-moderate-intensity home- or community-based exercise program that is adjusted to the participant's sleep–wake-up cycle should be discussed. A detailed exercise plan should be prescribed that takes into account the training heart rate range, and cardiac rehabilitation personnel should stay in touch with patients.

For patients needing to commence exercise sessions during Ramadan, a home-based light-intensity exercise program should be discussed, with the commencement of supervised exercise training sessions beginning after Ramadan.

8.4. Development of Cardiac Rehabilitation in the Kingdom of Saudi Arabia

Considering the high prevalence of obesity, diabetes, and physical inactivity in the Kingdom of Saudi Arabia, efficient cardiovascular prevention and cardiac rehabilitation programs are of paramount importance. Cardiac rehabilitation has gradually evolved into a multi-factorial program that involves managing cardiovascular risk factors and delivering nutritional, psychological, and social support to improve patient outcomes. Most of these steps have been implemented at the Prince Sultan Cardiac Center (PSCC) in Riyadh from 2009 by Dr. Fahad AlNouri, an outstanding expert on familiar hypercholesterolemia who has been serving as the President of the Saudi Group for Cardiovascular Prevention and Rehabilitation. Dr. AlNouri graduated with a Master of Science diploma in preventive cardiology, with merit for his dissertation, from the Imperial College London in 2009. Upon completion of his degree and his return to Riyadh, Dr. Alnouri set up the first ever Cardiovascular Prevention and Rehabilitation Unit within the Kingdom of Saudi Arabia. This unit employs a unique preventive cardiology clinic team comprising a cardiologist, dietician, physical activity specialist, clinical pharmacist, and health education nurse. One of the routine components of the clinic's practice is patient physical activity counseling. In February 2018, the first exercise training program in the Kingdom of Saudi Arabia was established by Dr. Adam Staron. Dr. Staron, serving as the Head of the Cardiac Rehabilitation Unit at Prince Sultan Cardiac Center, implemented the protocols of the Polish School of Cardiac Rehabilitation, modified later with regards to the local conditions. Over one thousand patients completed a supervised exercise training program (October 2021), achieving excellent outcomes (average improvement of physical capacity by 2.78 MET). In 2019, a separate female exercise area was created by Dr. Jadwiga Wolszakiewicz (Figures 19 and 20).

(**A**)

(**B**)

Figure 19. Male (**A**) and female (**B**) exercise areas at Prince Sultan Cardiac Center. Source: Photos by authors.

In addition, in 2020 the curriculum of the Cardiac Rehabilitation Fellowship Program for certified cardiologists was approved by the Saudi Commission for Health Specialties (authors: Wolszakiewicz, Staron, AlSulaimi). The same authors are being involved (June 2022) in writing Saudi Cardiac Rehabilitation guidelines and curriculum of the Cardiac Rehabilitation Fellowship for physiatrists. Supervised cardiac rehabilitation is currently being delivered in other healthcare facilities in the Kingdom (Sultan bin Abdulaziz Humanitarian City Riyadh, Dr. Soliman Fakeeh Hospital in Jeddah), with several other hospitals planning to establish cardiac rehabilitation services in a near future.

Figure 20. Cardiac rehabilitation staff—Prince Sultan Cardiac Center (November 2019). Source: Photo by authors.

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