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Sports And Exercise Medicine In India: Looking Beyond Injury

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Abstract: Sports Medicine (SM) is a recently established field in India that is often associated with the treatment of musculoskeletal (MSK) sports injuries. SM physicians, who possess sufficient training in medical-clinical and interventional physiological sciences, hold a significant position within the multidisciplinary and multispecialty team. They play a crucial role in combating the increasing prevalence of physical inactivity, sedentary lifestyles, and non-communicable diseases. Enhancing sports performance without the use of drugs is a crucial component that requires attention beyond the MSK-centric strategy in the field of SM. There exists a need for the promotion and comprehensive advancement of this distinctive field, necessitating the involvement of both governmental and non-governmental entities.

Key Words: : SM, exercise medicine, physical inactivity, doping, and sports performance.

Overview- The field of SM (SM) emerged in India in 1986-1987 with the introduction of the "PGDSM (post-graduate diploma in SM) program at NSNIS Patiala (Netaji Subhas National Institute of Sports) Patiala. This was followed by the introduction of MD SM programs in various medical colleges starting in 2010. This field, sometimes referred to as Sports and Exercise Medicine (SEM), encompasses the provision of comprehensive medical treatment for athletes and people engaged in physical activity. Additionally, it involves the use of exercise for medical and therapeutic objectives", as well as for the development of health and fitness. Therefore, an obsolete approach to SM is one that is myopic and only focused on sports injury therapy.

Combating Non-Communicable Diseases (NCDs) with SM- The field of Exercise Physiology, also known as Medical-Clinical and Interventional Physiology (MCIP), plays a significant role in combating "physical inactivity, sedentary lifestyles, and non-communicable diseases (NCDs). Physical inactivity is widely recognized as a worldwide issue, even referred to as a pandemic" (Haseler, Haseler, 2022). It was also identified "as the most significant health concern of the 21st century in 2009 (Blair, 2009). While not the only primary health issue, insufficient physical activity (PA) is a prominent risk factor for non-communicable diseases (NCDs) (Forberger, Wichmann, Comito, 2022) and early mortality, as shown in 2009 (Blair, 2009)". "Low cardio-respiratory fitness (CRF) resulting from inactivity, obesity, and other negative health impacts are major contributors to higher rates of illness and non-communicable diseases (Blair, Sallis, Hutber, Archer, 2012; World Health Organization, 2010, 2013). The significance of low CRF as a risk factor for non-communicable diseases (NCDs) surpasses that of the combined hazards associated with smoking, obesity, and diabetes (Blair, 2009; Tew, Copeland, Till, 2012). Steell et al. (2019) have demonstrated a dose-response association between low CRF and all-cause mortality, as well as the incidence and mortality associated with cancer and cardio-vasculo-respiratory disorders. According to Blair et al. (2012), the mortality rate caused by non-communicable diseases (NCDs) is projected to increase from 65% of all deaths in 2010 to over 75% by 2030. In addition to causing human misery, non-communicable diseases (NCDs) result in substantial economic losses for families, communities, and nations (Blair et al., 2012). In 2012, a study by Hallal et al. reported that 31.9% of adults (27.9% men, 33.9% women) and 80.3% of adolescents (13-15 years) were physically inactive. Similarly, in 2010, the World Health Organization (WHO) reported that 23% of adults and 81.0% (77.6% boys, 84.7% girls) adolescents (11-17 years) were physically inactive worldwide. India is the fifth most in South-East Asian nations and the 12th highest globally, with 15.6% (12.7% men, 18.4% women) of people aged 15 and above being physically inactive (Hallal et al., 2012). Additionally, 73.9% (71.8% boys, 76.3% girls) of adolescents aged 11-16 being physically inactive (Guthold et al., 2019). India accounts for more than 20.77% (equivalent to about 135 million) of the global population of obese people, and has a significant central obesity prevalence rate ranging from 16.9% to 36.3% (Ahirwar, Mondal, 2019)".

The "prevalence of diabetes, hypertension, and other non-communicable diseases (NCDs) connected to obesity is increasing rapidly in South Asian nations (Misra, Khurana, 2011)". India is sometimes referred to as the "diabetes capital," as it accounted for 16.63% (77 million persons) of the global diabetes population in 2019. Projections indicate that this percentage is likely to increase to 17.46% by 2030, with a corresponding growth of 31.17% in the number of individuals with diabetes in India (Federation, 2019). According to a research conducted by Sinha, Bhattacharya, Deshmukh, Panja, Yasmin,

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and Arlappa (2016), the prevalence of metabolic syndrome among senior individuals (e.g., 60 years) in southern India was found to be 42.1%. India exhibits a significantly elevated prevalence rate of hypertension, amounting to 30.7% (234 million) among persons aged 18 years and above. This prevalence "is > twice as high (22.4% versus 10.5%) compared to the United States (US) among young adults aged 20-44 years (Ramakrishnan et al., 2019)". According to Murray and Lopez (1996), it was anticipated that India will have a higher prevalence of cardiovascular diseases (CVDs) compared to other global regions by the year 2020. South Asians, including Indians, have a higher risk of developing non-communicable diseases (NCDs) at an early age, even when they have lower obesity rates. Additionally, "Indians experience mortality from cardiovascular events (CVEs) almost a decade earlier than developed countries. Specifically, 52% of Indians aged 70 and above die from CVEs, compared to 23% in developed countries (Ramakrishnan et al., 2019)".

In response to the pressing need for immediate intervention, several worldwide organizations have emerged with diverse initiatives aimed at combating physical inactivity and sedentary behavior. Blair et al. (2012) provide many examples of influential publications, including the "WHO Global Strategy on Diet, Physical Activity and Health" in 2004, the "Toronto Charter for Physical Activity: A Global Call for Action" in 2010, and the "Exercise is Medicine" by the American College of SM. The member states of the World Health Organization (WHO) set a goal in 2011 to stop the increase in diabetes and obesity. They also aimed "to reduce the prevalence of hypertension by 25% by 2025 and physical inactivity by 10% by 2025, as part of the "25 by 25" initiative (World Health Organization, 2013). Additionally, they set a goal to achieve a 15% reduction in physical inactivity by 2030, as outlined in the "Global Action Plan on Physical Activity 2018-2030" (Carrard et al., 2019; World Health Organization, 2018)". The "UN member states have set a target to decrease premature mortality caused by non-communicable diseases (NCDs) by 33% by the year 2030, as stated by the United Nations Population Division in 2015. The Government of India (GOI) initiated the "Fit India" campaign on August 29, 2019, the national sports day of India, to promote fitness and wellness in the country. This initiative was launched in honor of Major Dhyan Chand, a renowned hockey figure born on August 29, 1905 (Fit India, 2019; International Olympic Committee, 2019a).

The establishment of the WHO Global Centre for Traditional Medicine (GCTM) in Gujarat, India is being facilitated with the help of the Government of India (GOI) (World Health Organization, 2022)". The Indian traditional medicine system, including ayurveda medicine, incorporates a range of lifestyle treatments such as Yoga, dietary modifications, and physical activity. According to Sharma (2022), there have been suggestions on the potential origins of exercise-is-medicine, suggesting that it may have originated from the "Indian Indus Valley and Chinese Yellow River civilizations". According to "Sharma (2022), physicians specializing in SEM, who possess sufficient training in MCIP or Interventional Clinical Physiology (ICP), can collaborate with traditional medicine practitioners to address the widespread issues of physical inactivity, obesity, and non-communicable diseases (NCDs). This collaborative approach involves addressing various aspects such as diet/nutrition, exercise, sleep, and other lifestyle and functional interventions". This has particular significance due to the widespread use of traditional medicine by around 80% of the global population, as well as its status as the primary therapeutic approach for several ailments (World Health Organization, 2022).

Sufficient education in the fields of "SM, exercise medicine, and clinical-interventional exercise physiology is necessary". This knowledge enables the detection and repair of many lifestyle disorders by a physiological approach, prior to resorting to pharmacological or surgical intervention. Engaging in regular physical activity alone is insufficient; it is important to concurrently decrease sedentary behavior. Individuals who engage in regular physical activity yet excessively engage in lengthy periods of sedentary behavior, such as continuous sitting, continue to face a significant risk. This condition is sometimes referred to as the "active couch potato, Owen, Healy, Matthews, Dunstan, 2010". The physiological consequences resulting from extended periods of sedentary behavior (inactivity physiology) differ from those associated with insufficient physical activity. The detrimental health consequences of extended periods of sitting are unrelated "to the beneficial impact of consistent physical activity" (Owen et al., 2010). A medical professional with extensive knowledge in the fields of exercise physiology and sedentary physiology may successfully contribute to combating physical inactivity and sedentary behavior. Therefore, "it is imperative to ensure the recruitment, engagement, and attachment of qualified physicians in all national and state initiatives pertaining to health, physical activity, exercise, fitness, lifestyle modification, and non-communicable diseases (NCDs). This should be done within suitable organizations, bodies, institutions, or departments, such as government health services and public hospitals. According to Sirisena, Lim, and Teh (2016), it is argued that they should not be limited only to the domains of sports and military".

Enhancing Performance in Sports without the Use of Substances- Regrettably, the prevalence of doping via the use of prohibited substances/methods among athletes is rather widespread. In some nations, historical records indicate instances

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of medically-supervised and regulated use of performance-enhancing substances or techniques, as well as instances of state-sanctioned doping. The primary focus for most top athletes is on performance rather than healing and wellness (Hoberman, 2002; Speed, Jaques, 2011; Wiesing, 2011). The World Anti-Doping Agency (WADA) was established in 1999 and routinely updates its rules. According to Speed (2013) and the World Anti-Doping Agency (2019b), the code encompasses drugs and activities that are prohibited.

The worldwide proportion of analytic anti-doping rule violations (A-ADRVs), which refers to the breach of WADA code article 2.1 pertaining to athletes, was reduced from 66.42% in 2013 to 43.73% in 2016, out of the total adverse analytical findings (AAFs). According to the World Anti-Doping Agency (2019a), the prevalence of AAFs among athletes who possess valid therapeutic use exemptions (TUEs) saw a rise from 8.78% in 2013 to 11.18% in 2016. The proportion of non-analytical ADRVs (NA-ADRVs), which refers to violations of WADA code articles 2.2 to 2.8 (2009 WADA code) and 2.10 (2015 WADA code), among medical staff and other athlete support personnel (ASP) in addition to athletes, rose from 13.62% in 2013 to 16.87% in 2016. It is worth noting that 7.81% of NA-ADRVs were caused by ASPs in 2016 (World Anti-Doping Agency, 2019a).

The situation in "India is very concerning and requires immediate and efficient action from all parties involved. According to the World Anti-Doping Agency (2019a), the proportion of ADRVs (A-ADRVs, NA-ADRVs) in relation to the total world ADRVs for India was 4.86 (5.39, 1.50)% in 2013, 5.67 (6.29, 1.73)% in 2014, 6.07 (6.97, 0.71)% in 2015, and 4.33 (5.13, 0.37)% in 2016. India continuously ranked first in Asia for the most number of ADRVs from 2013 to 2016. It also ranked fourth globally in 2013, third in 2014 and 2015, but unfortunately dipped to sixth in 2016 with a total of 69 ADVRs (68 A-ADVRs and 1 NA-ADVR in wrestling). According to the World Anti-Doping Agency (2019a), the highest number of ADRVs occurred in athletics (30.43%), followed by powerlifting and weightlifting (20.29% each), kabaddi (13.04%), and wrestling (7.25%). The National Anti-Doping Agency (NADA) of India, a subsidiary of WADA, was founded on November 24, 2005 by the Government of India (GOI) with the objective of ensuring dope-free sports in India. From April 2018 to March 2019, NADA recorded a total of 187 (4.30% of the total sample analyzed) AAFs and 18 (0.41% of the total sample analyzed) TUEs. According to the National Anti Doping Agency (2017, 2018), the highest percentages of AAFs were seen in the bodybuilding category (32.09%), followed by weightlifting (21.93%), athletics (9.63%), powerlifting (6.95%), wrestling (3.21%), and kabaddi and Judo (2.67% apiece)".

Despite the "implementation of several anti-doping awareness initiatives by the National Anti-Doping Agency (NADA) across the nation, it is regrettable that the active participation of SEM doctors by the relevant authority is insufficient (National Anti-Doping Agency, 2017). According to Mazanov, Backhouse, Connor, Hemphill, and Quirk (2014), SEM doctors possess specialized training in anti-doping science and are the most informed among ASPs. SEM doctors should have a prominent position in combating the issue of doping and play a significant and influential part in anti-doping education and awareness campaigns. This aspect holds significance due to the notable prevalence of "unintentional" doping, as indicated by the WADA statistics of 4.17%, 13.66%, and 8.78% in 2013; 5.77%, 13.86%, and 9.79% in 2014; and 7.69%, 7.06%, and 11.90% in 2015 for "no sanction," cases with valid reason without TUE, and cases with valid TUEs, respectively (Chan, Tang, Yung, Gucciardi, Hagger, 2019). SEM physicians should be recruited, attached, and engaged in relevant programs, organizations, bodies, institutions, or universities that focus on anti-doping, sports, performance, and physical education. This includes sports federations, as well as national and state government youth affairs and sports departments. In addition to combating doping, it is crucial to address the relatively low ratio of international sports performance to population. In the context of India, the SM component of Sports Exercise Medicine (SEM) and performance-related sports and exercise physiology (pSEP) have significant importance. According to the Office of the Registrar General & Census Commissioner (2019), India has a population of 1.21 billion, making it the second most populous country. Among this population, 65% are under the age of 35 and 27.5% are between the ages of 15 and 29. This makes India one of the youngest countries, as stated by the Department of Sports (2018). Regrettably, the performance of India in international sports, particularly in the context of the summer Olympics, has been subpar. During the period spanning from the Paris 1900 to Rio 2016 summer Olympic games, India achieved a total of 9 gold, 7 silver, and 12 bronze medals. Notably, the men's hockey sport achieved 8 gold, 1 silver, and 2 bronze medals, as reported by the Indian Olympic Association (2018) and the International Olympic Committee (2019b). India's delegation of 117 athletes participated in the 2016 summer Olympics in Rio, making it the highest contingent to date. However, India only managed to secure two medals, one silver and one bronze (Indian Olympic Association, 2018; International Olympic Committee, 2019b). India's expenditure on sports in relation to its substantial population is relatively low, amounting to Rs.1393.21 crores or approximately 3.196 paise per person per day for the fiscal year 2017-2018. However, there has been

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a modest increase in this expenditure, as reported by the Parliament of India Rajya Sabha Department-Related Parliamentary Standing Committee on Human Resource Development in 2018. An additional significant issue that has been consistently brought up is the absence of athletes in positions of authority and management within sports institutions, such as the Sports Authority of India (SAI), by individuals lacking any sports experience and operating in a rigid and uniform bureaucratic manner (Parliament of India Rajya Sabha Department-Related Parliamentary Standing).
Publication by the Committee for Human Resource Development in 2015".

Following the underwhelming performance at Rio 2016, the Government of India (GOI) has been actively engaged in various initiatives, ranging from grassroots to elite levels, particularly through the national program known as "Khelo India." These efforts "aim to promote and enhance sports, foster a sporting culture, and ultimately enhance the country's international sporting performance (Department of Sports, 2018; Parliament of India Rajya Sabha Department-Related Parliamentary Standing Committee on Human Resource Development, 2018). The establishment of the Target Olympic Podium Scheme (TOPS) in 2014 aimed to provide support to highly skilled athletes who have the potential to win medals in the Olympic Games (Sports Authority of India, 2019). In 2017, the Government of India (GOI) established a task group to develop an action plan for the next three Olympic Games (2020, 2024, and 2028) (Press Information Bureau, 2017)". Regrettably, there is a deficiency in the involvement of SEM doctors, who has expertise in this particular domain. It is important to handle this issue in order to achieve long-term success. Furthermore, the nation lacks a sufficient quantity of SEM doctors who possess "comprehensive training in pSEP, MCIP, and sports and exercise sciences (SES).

The Government of India (GOI)" is prioritizing the academic and intellectual aspects of sports development via "Scheme of Human Resource Development in Sports" (Department of Sports, 2019). It is recommended that "central institutes/ universities of national significance and high quality, following the framework of the All-India Institute of Medical Sciences (AIIMS), be established nationwide with a specific emphasis on Sports-Exercise Medicine and Sciences (SEMS) and MCIP. Additionally, national centers akin to the United Kingdom's National Centre for Sport and Exercise Medicine (NCSEM), which was established in 2012 in the UK to contribute to the advancement of Olympic health legacy (Tew et al., 2012), should be established. The National Sports University (NSU), established in 2018 in Imphal, Manipur by the Government of India (GOI) to promote sports education and serve as the national training center for selected sports disciplines, should include the recruitment of SEM physicians and scientists, as well as the development of world-class SEMS and MCIP departments (National Sports University, 2019). The objective is to enhance the nation's position as a global leader in sports, rather to only focusing on physical education inside the university, as is the case with other physical education institutions and universities in the country".

The Advancement and Prospects of SM- In recent times, there has been a growing interest in the field of SM from medical professionals, the socioeconomic community, and the general public. The aforementioned outcome may be attributed to the collective efforts of governmental entities and diverse non-governmental organizations (NGOs). "Indian Association of SM (IASM), Indian Federation of SM (IFSM), and Indian Society of Sports and Exercise Medicine (ISSEM) are the three primary national-level non-governmental organizations (NGOs) operating in the aforementioned field in India. The Indian Association of SM (IASM) is a professional association including individuals from several disciplines of sports sciences. It was founded in 1971 (Indian Association of SM, 2012). On the other hand, the Indian Federation of SM (IFSM) was created in 2004 as a trust comprised of physicians specializing in contemporary medicine for sports (Indian Federation of SM, 2013). The Indian Society of Sports and Exercise Medicine (ISSEM) is a recently established national society that was established and officially registered on July 9th, 2019. Initially established by SEM specialists, ISSEM primarily catered to the needs of SEM specialists. However, it has since evolved to encompass all professionals in the fields of SEMS and MCIP, recognizing the diverse and interconnected nature of SEM (Indian Society of Sports and Exercise Medicine, 2020)". Given the growing "scientific and medical knowledge" and extensive research, these organizations are assisting SEM doctors in staying informed and integrating the most reliable evidence into their practice, so promoting the adoption of evidence-based SEM (EBSEM). Organizations must engage in collective, collaborative, and cooperative efforts to establish SEM as a highly developed specialty. They should also promote and ensure the full utilization of SEMS and MCIP.

Given the progress in the medical industry, the need for individualized medication, and the desire for improved human and sports performance, the specialization of SEM is essential for the future. The field of advanced research necessitates attention, as it holds the potential to yield significant advancements in various aspects such as athlete selection, nutrition, care and training, as well as the development of "ergonomic, supportive, and protective devices pertaining to physical activity and sports performance". Therefore, it is important to ensure that SEM professionals who are actively engaged in research within

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this sector, or those who want to undertake research, have sufficient recruitment and funding. It is necessary to transition from the narrow and obsolete paradigm of SM, "which focuses only on treating musculoskeletal injuries, to a model that emphasizes human performance, sports performance, fitness, and total health. The lack of widespread knowledge and the tendency to mistakenly associate SEM with other conventional medical and allied health fields such as orthopaedics, physical medicine and rehabilitation (PMR), or physiotherapy/physical therapy are gradually diminishing as SEM" establishes itself as a distinct and specialized medical domain. Ultimately, this will function as a catalyst for improved human and sports performance, as well as a decrease in injuries and impairments associated with both sports and physical activities, as well as inactive lifestyles.

Given the multifaceted nature of the factors influencing health, fitness, and the absence of doping in human and sports performance, it is essential to adopt a comprehensive and interdisciplinary strategy that encompasses several specialties. The integration of SEMS and MCIP, with close collaboration between SEM doctors and other relevant and allied experts, will undoubtedly have a significant influence. The recent adoption of the "integrated performance health management and coaching model emphasizes the significance of an integrated approach (Brukner et al., 2018)". The enhancement and widespread availability of SEM specialist services are expected to positively impact the athletic performance of athletes participating in both national and international contests. It is essential to actively engage and attract professionals in the field of SEM in both governmental and non-governmental sectors. Additionally, it is crucial to ensure the provision of sufficient research facilities and infrastructure to support the advancement of SEM.

Concluding remarks- SM, often known as SEM, encompasses more than only the treatment of musculoskeletal ailments and has a broader scope of responsibilities. The potential impact of this intervention is noteworthy in addressing the increasing prevalence of physical inactivity, sedentary lifestyles, non-communicable diseases (NCDs), as well as the issues of doping and poor sports performance to population ratio. The current era necessitates the recognition and advancement of this significant and distinctive field, given its prominent position within the collaborative efforts of many academic and specialized teams focused on promoting health, fitness, and ensuring the absence of doping in "human and sports performance".

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