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Review Article

An Approach to Available Literature about Association of Blood Redox State and Exercise

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ABSTRACT

Imbalance between reactive oxygen species (ROS) and antioxidants is termed as oxidative stress. Although low level of ROS are considered beneficial and important for normal functioning of cells. This research study review the available literature about exercise with various intensities and blood redox state. In this regard, data from 2015 to 2022 were collected from different search engines including PubMed, Web of Science, Scopus and Google scholar. The collected data were analyzed through qualitative data analysis technique and thus the researcher arrived at conclusion that exercise with moderate intensity having beneficial effects on blood redox state as compared to high intensity exercise.

INTRODUCTION

Physical activities with moderate volume and intensities promote the functional capacities of whole body systems. Physical activities with high volume and intensities effect the resistance capacity of the body against oxidative stress [1]. Oxidative stress refers to imbalance state of ROS and antioxidants. In sedentary as compared to active people, level of oxidative stress is found high [2]. Physical activeness reduce the antioxidant capacity and induce the rise of ROS which cause oxidative stress and thus it effect the physiology of various body systems. To strengthen the functional capacity of antioxidant defense mechanism, exercise with sufficient volume and intensities are encouraged. Exercise has positive association with oxidative stress and cardiovascular risk factors such as blood pressure, body mass index and fats percentage in postmenopausal women [3]. Regular exercise and antioxidant supplementation having more favorable effects on physical function and resistance to oxidative stress and thus its helps in reducing cardiovascular health complications [4]. Different studies shown that high intensity exercise increase the production of Reactive oxygen and nitrogen species (RONS) that cause several damages to Lipid, DNA, and protein oxidation in blood cells. High level of RONS may cause cardiovascular problems, problems of immune system and increase the risk of some cancers. Regular exercise helps in reduction of RONS by strengthening the antioxidants capacity of the body [5]. High intensity exercise performers as well as heavy

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drinkers may be proven at high level of oxidative stress. To avoid the oxidative damage of alcohol and exercise, dietary supplements are suggested [6]. For improvement of performance, dietary nitrates and thiol antioxidants are considered important particularly for endurance trainers. Both are considered safe for human being. Therefore single dose of both may have positive impact upon performance [7]. Research study shown that long as well as short distance runners both having similar blood redox status. In addition, higher activity of catalase in long distance runners was also observed. It may be due to high oxygen load imposed during repeated prolonged exercise bouts [8]. Improvement in quality of life is closely linked with exercise among patients with chronic diseases. It means that exercise strengthen the functional capacity of immune system [9]. Oxidative stress and redox dysregulation are considered responsible with asthma. Due to chronic inflammation, lungs tissues are exposed to a range of exogenous (Exogenous sources include air pollutants, particulates, and cigarette smoke, with endogenous ROS produced as by-products of mitochondrial respiration, inflammatory cell responses to allergens and microbial infections) and endogenous reactive oxygen (ROS) and nitrogen species (RNS) [10]. Exercise with moderate intensity promote cardiovascular health and strengthen the immune system by promoting the antioxidant system of the body. Likewise, it's also promote and maintain blood redox state [11-14]. In addition, moderate intensity exercise significantly affect lungs functions (IRV &ERV) [15]. Long term regular exercise promote health by maintaining blood redox state. High intensity exercise without adaptation and nutritional supplementation may cause oxidative stress [16]. In view of the above studies, now it is clear to say that blood redox state is very closely associated with exercise. So what type of exercise having positive effects on blood redox state and what kind of exercise having negative effects on blood redox state? To discover the fact, this review study was initiated.

METHODS

To reach at certain findings and conclusion, the researcher adopted the following procedures; at 1st step, more than 100 articles were collected from different search engines such as Google Scholar, PubMed, Web of sciences and Scopus etc. After collection of relevant articles, articles were divided into two categories i.e. catogery-1 articles (articles from last 20 to 22 years) were used for background section and category-2 articles (articles from last 5 t0 7 years) were used analysis section of article. At initial scrutiny, more than 75 non-relevant articles with keywords of the study were excluded. Similarly after initial scrutiny, articles of Google Scholar, and PubMed were included in the study. At end, qualitative data analysis (QDA) technique was adopted for analysis of data as shown in table 1.

Authors	Years	Sample	Major Findings
Khan *et al* [17]	2021	Low and High Intensity Exercise Performers	Low intensity promote antioxidants mechanism while high intensity exercise induced oxidative stress
Tofas *et al* [4]	2019	Meta-analysis	Exercise reduce the risks of cardiovascular problems
Lu Y, Wiltshire HD, Baker JS, Wang Q.[18]	2021	Meta-analysis	Regular exercise promote fitness and empower antioxidants activities
Parker L, Trewin A, Levinger I, Shaw CS, Stepto NK [19]	2018	Eight healthy adults performed a cycling session	Blood redox state and exercise intensities are associated with each other
Said M [5]	2016	Meta-analysis	Strenuous physical activities caused an increase in ROS
He F, Li J, Liu Z, Chuang CC, Yang W, Zuo L [20],	2016	Meta-analysis	Endurance, sprint and mountain climbing exercise cause production of ROS
Spanidis Y *et al* [21]	2018	Forty volunteers (trained & untrained)	Training adaptation as well as nutritional supplementations promote blood redox state and reduce ROS
Reid MB [22]	2017	Meta-analysis	Dietary supplementations and exercise endurance strengthen antioxidant activities and blood redox state
Georgakoul K *et al* [23]	2022	17 heavy drinkers	Heavy drinkers prone more to oxidative damage and exercise activate antioxidant defense mechanism

Table 1: Analysis of data from literature

CONCLUSIONS

After critical review of previous articles, the researcher draw the conclusion that exercise have a significant effects on blood redox state. In addition the study also shown that low intensity exercise positively effect the blood redox state. The literature review also shown that long term high intensity exercise without nutritional supplementations cause oxidative stress which leads the body toward different health problems. The findings of the study also reveals that for avoiding the health related risks of exercise, proper nutritional supplementation is considered essential.

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Conflicts of Interest

The authors declare no conflict of interest

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