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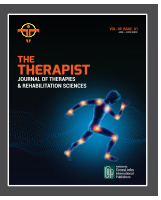

Original Article

Impact of Vigorous Exercise on Blood Serum Creatinine Concentration Among Students Athletes

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ABSTRACT

Creatinine is a chemical compound left over from energy-producing processes in your Healthy kidneys that filter creatinine out of the blood. Creatinine exits your body as a waste product in urine. **Objective:** To examine the impact of vigorous-intensity exercises on serum creatinine concentration among student athletes. **Methods:** Participants were categorized as the control group (CG=n-15) and the experimental group (EG=n-15). Eight-week self-made vigorous intensity exercise protocol was applied on EG. 5 ml blood was collected from each subject, and similarly, serum creatinine concentration was assessed through a serum creatinine test in a biochemistry laboratory. The results (pre and post-test) were statistically tested by independent t-test, mean, and paired sample t-test as statistical tools. **Results:** A statistically significant difference was found in the Creatinine level between the pretest and posttest scores of EG ($P < 0.05$) after the treatment. No significant difference was observed in Creatinine level in CG's pretest and posttest scores ($P > 0.05$). **Conclusions:** The study shows a considerable difference in the pre and post-test of the subjects of CG and EG, and thus it is shown that vigorous exercise has a positive impact on kidney functions, particularly on creatinine.

INTRODUCTION

Exercise refers to all those physical activities that increase the heart rate beyond normal. It is considered necessary for the preservation of physical as well as mental health [1]. Vigorous exercise requires high oxygen intake, such as running, swimming, soccer, jumping, carrying heavy loads, etc. [2]. In other words, vigorous activities are defined as activities ≥ 6 METS. From a health point of view, it is essential to perform the exercise as per the body's nature and requirements [3]. Kidneys are located on each side of the spine just below the rib cage. They are part of the urinary tract and filter blood from other wastes and toxic products produced during metabolic reactions and extra water to make urine [4-6]. Human kidneys are bean-shaped organs in the renal system that execute many vital functions, including preserving overall fluid balance [7, 8]. Inside the human body, healthy kidneys filter about half a cup (125mL) of blood per minute, removing different waste materials from the blood and extra water to make urine. The urine flows from the kidneys through two thin tubes, known as the ureter, to the bladder, while the bladder is part of the urinary tract [9-11]. Creatinine is produced due to the breakdown of creatine in muscles cells during

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contractions; when the muscle contract quickly then, the study of creatine occurs, which makes energy for body organs movements, improves muscles mass and release Creatinine is a waste product, which mixed with blood and filters in kidneys and remove with urine. This test quantify the ration of creatinine in blood is Serum creatinine [12, 13]. According to Wallimann *et al.*, and Wyss and Kaddurah-Daouk, almost adult healthy males whose kidneys perform normal functions typically range from 0.6 to 1.2 (mg/dL) of Creatinine in their blood, and nearly adult healthy females whose kidneys perform normal functions have about 0.5 to 1.1 mg/dL average level of Creatinine in their blood. Females usually have fewer creatinine levels than males because females are mostly less muscular than males [14, 15]. Kidneys perform essential functions in the human body to filter the blood from the different products produced during various metabolic activities inside the body [6, 16]. The field of medical, chemical, surgical and pharmaceutical sciences provides their solution to deal with kidney problem in their ways. Preliminary work was done in sports sciences and physical education to deal with kidney problems through exercise science.

METHODS

Male students were randomly selected from the Department of Sport Sciences and Physical Education (DSSPE), Gomal University (GU), Dera Ismail Khan (DIK), Pakistan. The participants, aged 18-22 years, used no medications and had no chronic health problems, and the subjects who volunteered to participate were included in the study. After applying the said criteria, the subjects were randomly categorized as the control group (CG=n-15) and the experimental group (EG=n-15). The study was followed with a single-dimensional experimental design with both two groups of the study. This sample size calculation for the study was made based on the availability and consent of the subjects and the criteria set for the selection for participation. Eight-week self-made vigorous intensity exercise protocol was applied on EG. 5 ml blood was collected from each subject, and similarly, serum creatinine concentration was assessed through a serum creatinine test in a biochemistry laboratory. The results (pre and post-test) were statistically tested by independent t-test, mean, and paired sample t-test as statistical tools.

RESULTS

Table 1 showed that the total respondents of the study were 30, the minimum age was 18 years, the maximum was 24 years, and the mean age was 20.46±1.53. The minimum height of the respondents was 160cm, the maximum was 185.88cm, and the mean height was 172.24±7.04. The minimum weight of respondents in the pretest was 56kg, the maximum was 92kg, and the mean weight in the pretest was 67.35±8.91. The minimum weight of respondents in the posttest was 53kg, the maximum was 78kg, and the mean weight in the posttest was 61.60±6.44. The minimum BMI in the pretest was 17.59, and the maximum was 31.08; the mean BMI in the pretest was 22.71±2.75. The minimum BMI in the posttest was 16.54, and the maximum was 26.93. The mean BMI in the posttest was 20.82±2.41.

Table 1: Analysis of respondents based on Age, Weight, Height and BMI

Variables	N	Min	Max	Mean ± SD
Age (years)	30	18.00	24.00	20.46±1.53
H (cm)	30	160.00	185.88	172.24±7.04
W (kg) pre	30	56.00	92.00	67.35±8.91
W (kg) post	30	53.00	78.00	61.60±6.44
BMI in Pre-test	30	17.59	31.08	22.71±2.75
BMI in Posttest	30	16.54	26.93	20.8246±2.41

Table 2 shows the pretest and posttest differences between Experimental Group B (VIE) and Control group on the weight pretest, weight posttest, BMI pretest and BMI posttest. No statistically significant differences were found in weight pre ($p > 0.05$) and BMI pre ($p > 0.05$), and statistically significant differences were found in BMI post ($p < 0.05$) and weight post ($p < 0.05$).

Table 2: Pre and Posttest differences between CG and EG in term of Weight and BMI

Measurements	VIE Group n=15	Control Group n=15	T	Sig.
	Mean ± SD	Mean ± SD		
Weight Pre	66.26±7.89	69.13±10.43	-.849	.403
Weight Post	58.50±6.17	64.67±4.22	-3.142	.004
BMI Pre	22.36±2.64	23.62±2.71	-1.291	.207
BMI Post	19.77±2.00	22.22±1.83	-3.489	.002

Table 3 shows the pretest and posttest differences between EG and CG at the Creatinine level. Significant was found in the Creatinine level between the pretest and posttest scores of EG ($p < 0.05$) after the treatment. No difference was found in Creatinine level between the pretest and posttest scores of CG ($p > 0.05$).

Table 3: Pre and Posttest difference of CG and EG in Term of Creatinine Level

Measurements	Pretest Creatinine	Posttest Creatinine	T	Sig.
	Mean ± SD	Mean ± SD		
VIE Group (EXP-B)	.773±.059	.953±.124	-6.874	.000
Control Group	.753±.091	.753±.074	.000	1.00

DISCUSSION

The study aimed to highlight the impact of vigorous exercise on blood serum creatinine concentration among student athletes; therefore, two groups that were CG and EG, comprised of 30 subjects (each group was formed of 15 participants), were randomly selected and thus, exercise protocol of vigorous activity was applied on EG. After careful completion of the study, the results showed a statistically significant difference in Creatinine level

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between the pretest and posttest scores of EG ($p < 0.05$) after the treatment. No significant difference was observed in Creatinine level in CG's pretest and posttest scores ($p > 0.05$). Another study conducted showed that creatinine excretion increased by 50% during exercise among the subjects [17]. So this study is also in link with the finding of the current research. Likewise, the survey conducted among eighty-eight subjects showed a significant correlation between creatinine concentrations and the 24-h urine volume: r=0.786, p<0.001 [18]. So this emerging finding also supports the result of the present study. The same result is shown by another study that people with chronic kidney diseases (CKD) or blood pressure should have kidney problems [19]. On the other hand, people interested in chronic kidney disease (CKD) should have a high level of creatinine in their blood [20]. Another study suggested that an increase in creatinine levels among healthy people can easily filter creatinine from the blood due to the enhancement of kidney functions. The study's finding shows a significant effect of exercise on BMI. In line with this finding, the surveys conducted by sikiru and Okoye and Johansen and Painter found that moderate-intensity exercise increases the level of creatinine level to customary conditions because creatinine produces due to the quick contraction of muscles [21, 22]. Another side the findings of this study also found that moderate-intensity exercise is also beneficial for the improvement and boosting kidney functions as well as another overall organic system of the human body. No requirement occurred for dialysis—the blood from different waste products is produced during various metabolic activities.

CONCLUSIONS

Based on analysis and findings, the researcher concluded that there is a significant difference in the pre and post-test of the subjects of CG and EG. Thus it is shown that vigorous exercise has a positive impact on kidney functions, particularly on creatinine. Therefore this research will lead to the development of a test model for players in higher education institutions. Almost our athletes, as well as bodybuilders who perform a daily high-intensity activity, will achieve optimal awareness and guidelines regarding the effect of moderate and vigorous intensity exercise on kidney filtration functions that, through regularly participating in any physical activity, can lead to nutritional health and long life expectancy.

Authors Contribution

Conceptualization: MU
Methodology: AK
Formal analysis: MJ
Writing-review and editing: MZIB, IU, MZ, SS, HN
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest

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