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COMPARATIVE ANALYSIS OF THE EFFECTS OF MODERATE LEVEL EXERCISES ON FILTRATION FUNCTION AND HEALTH OF KIDNEYS: TARGETING ON BLOOD AND UREA OF CRICKET PLAYERS

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ABSTRACT
Background: *This study aimed to investigate the effects of moderate-level exercises on renal filtration function and kidney health indicators among young cricket players at Gomal University, Dera Ismail Khan, Pakistan. Regular physical activity is known to influence various physiological functions, including renal health, yet specific impacts on kidney function in athletes have not been extensively explored.*
Methods: *A total of 60 male participants were recruited from Gomal University and divided into an experimental group (n = 30) receiving a structured exercise intervention and a control group (n = 30) without intervention. Renal Function Tests (RFTs) and urinalysis were conducted to measure urea levels pre- and post-intervention. Data were analyzed using SPSS version 27, employing paired samples t-tests and independent samples t-tests to evaluate differences between groups.*
Results: *The experimental group showed a significant reduction in post-test urea levels (M = 28.1 mg/dL, SD = 4.9) compared to pre-test levels (M = 32.5 mg/dL, SD = 5.1), with a mean difference of 4.4 mg/dL (t(29) = 5.67, p < 0.001). In contrast, the control group exhibited no significant change in urea levels (pre-test: M = 31.8 mg/dL, SD = 4.8; post-test: M = 31.7 mg/dL, SD = 5.0). Moreover, significant differences in kidney health indicators were observed between the groups post-intervention, with the experimental group showing improved outcomes (U = 320.0, z = -3.45, p = 0.001).*
Conclusions: *The findings indicate that moderate-level exercises positively affect renal filtration function and enhance kidney health indicators among young athletes at Gomal University. This underscores the importance of incorporating physical activity into training regimens for cricket players to promote overall health and performance.*
Keywords: *renal filtration function, kidney health, moderate exercise, cricket players, urea levels.*

INTRODUCTION
The relationship between physical activity and kidney health has garnered increasing attention in recent years, particularly in the context of athletic populations. Kidney function is critical for maintaining homeostasis, managing waste products, and regulating fluid balance in the body (Beddhu et al., 2019). In athletes, especially those engaged in high-demand sports such as cricket, understanding the impact of moderate physical exercise on renal filtration function is essential for optimizing performance and promoting long-term health (Kirkland et al., 2022). Moderate exercise has been

shown to enhance renal blood flow and improve glomerular filtration rate (GFR), potentially reducing the risk of renal dysfunction (He et al., 2021). This is particularly relevant for cricket players, who experience unique physiological demands during play that can influence kidney health (Kumar et al., 2023). The complexity of these interactions necessitates further investigation, especially since renal health can be affected by factors such as hydration status, intensity of physical activity, and dietary habits (Dreyer et al., 2020). Moreover, while previous studies have established a connection between exercise and various health outcomes, there is a paucity of research specifically addressing how moderate exercise impacts renal function in cricket players. This study aims to fill this gap by comparing pre- and post-exercise renal filtration function and health indicators among cricket players, thereby contributing to the understanding of exercise's role in renal health. Despite the apparent fact that human health and exercise are controlled by quite separate physiological processes, there is mounting evidence that these two behaviors have crucial clinical links. It is well known that passive body heating helps healthy older adults who suffer from insomnia improve their human health at night. This result lends credence to the theory that variations in body temperature cause the brain's so monogenic regions to fire, resulting in human health. However, nothing is known about how this theory relates to the distal and core thermoregulatory responses to exercise. Acquiring this information may also aid in mitigating human health disturbances linked to night shift jobs. Adding physical exercise to a shift worker's already hectic schedule might be challenging because of their obligations to their families and their eating habits. To determine the ideal levels and timing of physical exercise for lowering shiftwork-related human health issues, a multi-research approach is required. Given the recently discovered links between obesity and short human health duration, the interactions among nutrition, exercise, and human health are particularly crucial. The cardiovascular safety of choosing an appropriate time for exercise should also be taken into account, as new research indicates that blood pressure is most responsive to changes in overall physical activity in the morning. This period of time is generally linked to an increased risk of a sudden cardiac event; however, further research is required to distinguish the effects of light, posture, and exercise in isolation on the hemodynamic responses to human health and physical activity that follow naps taken during the day and at night (Atkinson & Davenne, 2007).

The purpose of the study is to look at how differently moderate physical exercise affects renal filtration, specifically urea levels, in cricket players. Although it is well recognized that physical exercise affects kidney health, there hasn't been much research done, particularly on cricket players' activity patterns, which can differ understanding the effect of moderate physical activity on renal function, especially in terms of urea dynamics, could help improve training plans, keep athletes from getting hurt, and keep their health prompt in general. The study focuses on male cricket players from Gomal University in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. A total of 60 participants are recruited, divided equally into an experimental group and a control group. This research investigates the impact of moderate physical exercise on renal filtration function and kidney health indicators among the participants. The primary measure of interest is urea levels, with assessments conducted pre- and post-intervention. The study is conducted over a defined period, including baseline assessments (pre-test) prior to the intervention and follow-up assessments (post-test) after the exercise regimen. The specific timeline ensures a structured evaluation of changes in renal function.

The study aims to address the critical knowledge gap regarding the effects of moderate exercise on kidney health in athletes. Understanding these effects is essential for developing effective training programs and promoting athlete well-being. A quantitative research design is employed, utilizing statistical analyses such as paired and independent samples t-tests to assess differences in renal function between the experimental and control groups. Data collection includes urine and blood samples to measure urea levels and other kidney health indicators before and after the intervention.

The primary aim of this study is to investigate the effects of moderate physical exercise on renal filtration function and kidney health indicators, specifically focusing on urea levels, among male cricket players at Gomal University in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. The study seeks to assess how regular participation in moderate-level exercises influences the kidneys' ability to filter waste products, thereby evaluating the advantages or disadvantages such activity may have on kidney function in athletes. By comparing both pre-test and post-test renal filtration and kidney health indicators between an experimental group undergoing the exercise intervention and a control group maintaining their regular routines, the study aims to provide comprehensive insights into the relationship between physical activity and kidney health. This includes evaluating baseline differences, monitoring changes post-intervention, and identifying whether structured moderate exercise can significantly enhance renal function, ultimately contributing to improved training practices, injury prevention, and long-term well-being of athletes.

This study is guided by several hypotheses aimed at examining the impact of moderate physical exercise on renal filtration function and kidney health among cricket players. It hypothesizes that there is no significant difference in pre-test renal filtration function (H01) and kidney health indicators (H03) between the experimental and control groups before the intervention. However, it assumes that a significant difference will be observed in the post-test renal filtration function (H02) and kidney health indicators (H04) within the experimental group following the exercise intervention. Additionally, it posits that there is no significant difference in pre-test renal function between the groups (H05), but a significant difference will emerge in post-test kidney health indicators between the experimental and control groups after the intervention (H06). These hypotheses aim to establish whether moderate exercise produces measurable improvements in kidney function and health among athletes.

There are several significant reasons why comparing the effects of moderate physical activity on renal filtration function with an emphasis on urea levels among cricket players is important. Keeping athletes healthy and performing at their best requires an understanding of how exercise affects kidney function. Specialized advice may be given to maximize training schedules and reduce the risk of kidney-related problems by concentrating on cricket players, who have particular movement patterns and physiological demands. The whole health and performance of athletes depend on the condition of their kidneys. In order to lower the risk of renal-related injuries and complications, it is important to understand how moderate physical activity affects kidney filtration function, particularly with regard to urea levels. This knowledge can help develop targeted injury prevention strategies and rehabilitation protocols specifically for cricket players.

2.1 Research Design and test sample

The effects of moderate-intensity exercise on renal filtration function and kidney health indicators among young male cricket players at Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan—a location renowned for its academic excellence and active sports culture—were examined in this study using a quasi-experimental design. The sixty male cricket players were split evenly into an experimental group (n = 30) and a control group (n = 30). The participants were chosen using systematic selection to guarantee variation in age, playing experience, and fitness levels. While the control group carried on with their regular activities unabated, the experimental group engaged in a planned workout programme that mimicked the length and intensity of normal cricket practice, including aerobic and strength-building exercises. All ethical issues, including informed permission and anonymity, were rigorously upheld, and the university's resources and participant access enabled efficient implementation and accurate data collection. This methodology made it possible to compare the outcomes before and after the intervention with confidence, offering important new information on how athletes' kidney health is impacted by moderate physical exercise.

2.2 Sample Collection

Participants were asked to provide midstream urine samples and small venous blood samples (5 ml) to obtain critical biochemical data about renal function, specifically focusing on urea concentration (Humayun et al., 2015). Before data collection, each participant was provided with a comprehensive briefing on the methods to ensure comfort and comprehension, and signed informed permission was obtained in accordance with ethical research guidelines. Blood samples were acquired using aseptic venipuncture at two pivotal time points pre-intervention and post-intervention while urine samples were taken simultaneously to ensure analytical consistency. All specimens were meticulously managed and maintained under ideal circumstances to maintain their integrity, and analyses were performed using proven laboratory techniques to guarantee accuracy, dependability, and repeatability in evaluating urea levels and other renal biomarkers.

2.3 Experimental Design

The experimental design included the administration of Renal Function Tests (RFTs) and urine routine examination (R/E) on three separate occasions: before and after mild physical exercise. This approach aimed to assess the effects of exercise on urine composition and renal function. By comparing findings at different phases of activity, the study provided insights into how physical exertion influences kidney function and urine characteristics. This knowledge was essential for understanding the body's response to exercise stress. The design followed established protocols (Prigent, 2008; Pradella et al., 1988) and emphasized the importance of these assessments in evaluating renal health in relation to physical activity. The comprehensive analysis helped elucidate the relationship between moderate exercise and renal function, contributing to a better understanding of athletes' health and performance (Rosner & Bolton, 2006).

2.4 Instrument

The current study used many devices to thoroughly assess renal filtration function and kidney health markers in cricket players. A self-created questionnaire was used to gather demographic information (age, playing experience, etc.) and record physical activity patterns, guaranteeing precise characterisation and group assignment. Renal function tests (RFTs) were conducted using standardised laboratory protocols, assessing serum urea, creatinine, and electrolyte concentrations from 5 mL of blood samples obtained before and after the intervention. Urinalysis with microscopy evaluated urine urea content, specific gravity, and the presence of aberrant components, yielding essential insights into renal health. An organised physical activity regimen, mirroring the intensity and length of cricket practice, functioned as the intervention for the experimental group, guaranteeing uniformity in exercise exposure. Furthermore, a Perceived Exertion Scale recorded participants' subjective assessments of effort and recuperation, providing significant qualitative data about the physical and health effects of the exercise programme.

2.5 Statistical Procedure

This research used a systematic statistical analysis to examine the impact of moderate physical activity on renal filtration performance, specifically examining urea levels in cricket players (Gowda et al., 2010). Data were analysed via SPSS version 27, commencing with descriptive statistics that included participant characteristics and baseline data. The Shapiro–Wilk test was used to evaluate the normality of data distribution. Based on the data type and distribution, suitable inferential tests were utilised: paired t-tests and Wilcoxon signed-rank tests for comparing pre- and post-intervention values within groups, and independent t-tests and Mann–Whitney U tests for assessing differences between the experimental and control groups. Pearson's correlation analysis was used to investigate the associations among age, playing experience, and urea levels. All analyses were conducted with well-stated significance levels and effect sizes, guaranteeing a rigorous interpretation of the results.

3: Results

Table 3.1 provides a comprehensive overview of the demographic characteristics of the study participants, divided into experimental and control groups. The mean age of participants in the experimental group is 23.5 years, while the control group has a slightly higher mean age of 24.0 years, resulting in an overall mean age of 23.8 years for the total sample. The standard deviations of 2.1 for the experimental group and 1.9 for the control group indicate a relatively homogenous age distribution within both groups. Regarding playing experience, the experimental group exhibits a mean of 5.2 years, marginally higher than the control group's mean of 5.1 years, leading to a combined mean of 5.15 years across both groups. The standard deviations for playing experience, at 1.3 for the experimental group and 1.4 for the control group, further reflect a consistent level of experience among participants. Overall, these demographic attributes demonstrate that both groups are well-matched in terms of age and playing experience, enhancing the validity of the study's findings related to the effects of moderate-level exercises on renal function. This similarity helps ensure that any observed differences in renal filtration function and kidney health indicators can be attributed to the interventions rather than variations in demographic factors.

Table 3.1: Demographic Attributes of Participants

Demographic Attribute	Experimental Group (n = 30)	Control Group (n = 30)	Total (n = 60)
Age (years)			
Mean	23.5	24.0	23.8
Standard Deviation	2.1	1.9	2.0
Playing Experience (years)			
Mean	5.2	5.1	5.15
Standard Deviation	1.3	1.4	1.35

Table 3.2 shows the Shapiro-Wilk test results for normality, assessing urea levels in experimental and control groups. The experimental group had pre-test urea levels of 0.912 and p-value of 0.124, indicating normality. The control group had pre-test urea levels of 0.911 and p-value of 0.118, supporting normality. Post-test results showed a 0.907 and p-value of 0.085, confirming normality. All p-values exceeded the alpha level of 0.05, indicating normal distribution of urea levels. This supports the use of parametric statistical tests in comparing renal filtration functions between experimental and control groups.

Table 3.2: Normality Statistics for Urea Levels

Group	**Test**	**Shapiro-Wilk Statistic**	**df**	**Sig.**
Experimental Group	Pre-Test	0.912		0.124
	Post-Test	0.898	30	0.067
Control Group	Pre-Test	0.911		0.118
	Post-Test	0.907		0.085

Table No 3.3 Comparative analysis of urea levels across groups revealed that pre-test mean urea levels were analogous for the experimental group (32.5 ± 5.1 mg/dL) and the control group (31.8 ± 4.8 mg/dL), indicating equivalent baseline renal function. Post-test findings indicated a significant decrease in mean urea levels for the experimental group (28.1 ± 4.9 mg/dL) relative to the control group (31.7 ± 5.0 mg/dL), suggesting that moderate exercise correlated with enhanced renal filtration capacity.

Table No: 3.3 Urea level Pre-test and Post- test by group

Urea Levels Pre-Test by Group			Urea Levels Post-Test by Group		
Group	**N**	**Mean (mg/dL) ±SD**	**Group**	**N**	**Mean (mg/dL) ±SD**
Experimental Group	30	32.5±**5.1**	Experimental Group	30	28.1±4.9
Control Group	30	31.8±**4.8**	Control Group	30	31.7±5.0

Table 3.4 shows urea levels in experimental and control groups, with pre-test and post-test measurements. The experimental group had a pre-test mean urea level of 32.5 mg/dL, which decreased to 28.1 mg/dL post-test, indicating an enhancement in renal filtration capacity. The control group had a pre-test mean urea level of 31.8 mg/dL, which slightly decreased to 31.7 mg/dL after the same duration. The standard deviations were modest, indicating uniform urea levels among participants. Both groups showed comparable variability in urea levels.

Table 3.4: Descriptive Statistics for Urea Levels (mg/dL)

Measure	Experimental (Pre-Test)	Group Experimental (Post-Test)	Group Control (Pre-Test)	Group Control (Post-Test) Group
Mean (mg/dL)	32.5	28.1	31.8	31.7
Standard Deviation	5.1	4.9	4.8	5.0
N	30	30	30	30

4.5 Correlation Analysis

Pearson's correlation analysis showed no statistically significant relationship between age and urea levels in either group. For the experimental group, the correlation coefficient was r = −0.12 (p = 0.487), while for the control group it was r = −0.15 (p = 0.382). These results indicate that age was not a significant factor influencing urea levels in this study population.

Table3.5: Correlation between Age and Urea Levels Pre-Test

Group	Correlation Coefficient (r)	Sig. (2-tailed)
Experimental Group	-0.12	0.487
Control Group	-0.15	0.382

Table 3.6 shows the correlation coefficients between age and post-test urea levels in both experimental and control groups. In the experimental group, the correlation coefficient is -0.10, indicating a weak negative correlation, suggesting age does not significantly influence urea levels after the intervention. The high p-value confirms the absence of a statistically significant relationship, indicating that age is unlikely to be a factor in the observed changes in renal function. In the control group, the correlation coefficient is -0.20, indicating no significant relationship between age and post-test urea levels. The p-value remains above the conventional threshold of 0.05, reinforcing the conclusion that age does not significantly impact urea levels post-intervention. The results suggest that other factors, likely related to the exercise intervention itself, may play a more pivotal role in determining renal function outcomes, thus indicating that age is not a significant variable in the context of this study's findings.

Table 3.6: Correlation between Age and Urea Levels Post-Test

Group	Correlation Coefficient (r)	Sig. (2-tailed)
Experimental Group	-0.10	0.558
Control Group	-0.20	0.245

3.7 Pearson's correlation analysis revealed no statistically significant association between age and urea levels in either group at both pre-test and post-test phases. In the experimental group, the pre-test correlation was r = −0.05 (p = 0.780), while the post-test correlation was r = −0.15 (p = 0.395). In the control group, the pre-test correlation was r = −0.18 (p = 0.307), while the post-test correlation was r = −0.12 (p = 0.487). The data demonstrate that age did not substantially affect urea levels before or after the intervention in either group.

Table 3.7: Correlation between Playing Experience and Urea Levels Pre-Test and Post-Test

Group	Pre-test Correlation Coefficient (r)	Sig. (2-tailed)	Pot-test Correlation Coefficient (r)	Sig. (2-tailed)
Experimental Group	-0.05	0.780	-0.15	0.395
Control Group	-0.18	0.307	-0.12	0.487

3.8 Within-Group Comparisons

The Wilcoxon Signed-Rank Test revealed a statistically significant reduction in urea levels from pre-test to post-test in the experimental group ($W = 0.000$, $z = -5.67$, $p < 0.001$), indicating a substantial improvement in renal filtration function following the moderate-level exercise intervention. In contrast, the control group showed no significant change in urea levels over the same period ($W = 210.0$, $z = -0.21$, $p = 0.834$), confirming that the observed improvements were attributable to the exercise program rather than external factors.

Table 3.8: Wilcoxon Signed-Rank Test for Experimental Group and Control Group

Test	N	Wilcoxon Signed-Rank Statistic (W)	Z	Asymp. Sig. (2-tailed)
Experimental Group Pre-Test vs. Post-Test	30	0.000	-5.67	0.000
Control Group Pre-Test vs. Post-Test	30	210.0	-0.21	0.834

3.9 The **Mann–**Whitney U test revealed no significant difference in pre-test renal filtration function between the experimental group (median = 15.00 mg/dL) and the control group (median = 14.50 mg/dL), $U = 410.0$, $z = 0.45$, $p = 0.657$, therefore confirming similar baseline values. Post-test findings demonstrated a notable enhancement in kidney health indicators within the experimental group (median = 0.90 mg/dL) relative to the control group (median = 1.05 mg/dL), $U = 320.0$, $z = -3.45$, $p = 0.001$. The data indicate that moderate exercise significantly enhanced kidney function in cricket players.

Table 3.9: Mann-Whitney U Test for Pre and Post-Test Renal Filtration Function

Group	N	Pre- Test Median (mg/dL)	U	z	Sig. (2-tailed)
Experimental	30	15.00	410.0	0.45	0.657
Control	30	14.50			
Group	**N**	**Pot- Test Median (mg/dL)**	**U**	**z**	**Sig. (2-tailed)**
Experimental	30	0.90	320.0	-3.45	0.001
Control	30	1.05			

3.10 Independent Samples t-Test

An independent samples t-test comparing pre-test urea levels between the experimental group ($M = 15.10$, $SD = 3.45$ mg/dL) and the control group ($M = 14.80$, $SD = 3.20$ mg/dL) showed no statistically significant difference, $t(58) = 0.45$, $p = 0.655$. This confirms that both groups had comparable baseline renal function prior to the intervention.

Table 3.10 Independent Samples t-Test for Pre-Test Urea Levels

Group	N	Mean (mg/dL)	Std. Deviation (mg/dL)	T	df	Sig. (2-tailed)
Experimental	30	15.10	3.45	0.45	58	0.655
Control	30	14.80	3.20			

3.11 Paired Samples t-Test

A paired samples t-test for the experimental group showed a significant reduction in urea levels from pre-test to post-test, with a mean decrease of 5.30 mg/dL ($SD = 2.21$, $SE = 0.40$), $t(29) = 13.25$, $p < 0.001$. This substantial change indicates that the moderate-level exercise intervention had a strong positive effect on renal filtration function.

Table 3.11: Paired Samples T-Test for Post-Test Urea Levels in Experimental Group

Pair	N	Mean Difference	Std. Deviation	Std. Error Mean	t	Df	Sig. (2-tailed)
Post-Test Urea - Pre-Test Urea	30	5.30	2.21	0.40	13.25	29	0.000

3.12: Independent Samples t-Test (Post-Test)

The Independent Samples t-Test compared pre-test kidney health indicators between experimental and control groups. The experimental group had a mean of 1.00 mg/dL, while the control group had a mean of 1.05 mg/dL. The calculated t-value was -1.06, suggesting a slight difference between the two groups, but this was close to zero, indicating no substantial difference. The degrees of freedom for the test were 58, and the Asymptotic Significance value was 0.295, exceeding the alpha level of 0.05, indicating no statistically significant difference in pre-test kidney health indicators between the experimental and control groups.

Table 3.12: Independent Samples t-Test for Pre-Test Kidney Health Indicators

Group	N	Mean (mg/dL)	Std. Deviation (mg/dL)	t	df	Sig. (2-tailed)
Experimental	30	1.00	0.15			
Control	30	1.05	0.20	-1.06	58	0.295

3.13 Paired Samples t-Test (Kidney Health Indicators)

A paired samples t-test for the experimental group revealed a significant improvement in kidney health indicators from pre-test to post-test, with a mean change of −0.10 mg/dL (SD = 0.05, SE = 0.01), $t(29) = -8.54$, $p < 0.001$. This substantial reduction suggests that the moderate-level exercise intervention had a marked positive effect on kidney function.

Table 3.13: Paired Samples T-Test for Post-Test Kidney Health Indicators in Experimental Group

Pair	N	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Post- Pre-Test Kidney Health	30	-0.10	0.05	0.01	-8.54	29	0.000

3.14 Independent Samples t-Test (Pre-Test Kidney Health Indicators)

An independent samples t-test comparing pre-test kidney health indicators between the experimental group (M = 15.00, SD = 3.00 mg/dL) and the control group (M = 14.50, SD = 2.80 mg/dL) showed no statistically significant difference, $t(58) = 1.05$, $p = 0.299$. This indicates that both groups started with comparable kidney health at baseline, supporting the validity of subsequent comparisons.

Table 3.14: Independent Samples t-Test for Pre-Test Renal Filtration Function

Group	N	Mean (mg/dL)	Std. Deviation (mg/dL)	t	df	Sig. (2-tailed)
Experimental	30	15.00	3.00	1.05	58	0.299
Control	30	14.50	2.80			

The results from Table 4.15 indicate a statistically significant difference in post-test kidney health indicators between the experimental and control groups. The experimental group, which underwent moderate-level exercises, had a mean kidney health indicator of 0.90 mg/dL (SD = 0.12), compared to the control group's mean of 1.05 mg/dL (SD = 0.15). The t-test results show a t-value of -3.57 with 58 degrees of freedom, yielding a p-value of 0.001. This finding supports the hypothesis that moderate-level exercises have a significant positive effect on kidney health indicators in the experimental group compared to the control group. The lower mean value in the experimental group suggests improved kidney function and health as a result of the exercise intervention. The significant difference observed provides strong evidence for the benefits of incorporating moderate physical activity into training programs for athletes, highlighting the role of exercise in promoting kidney health.

Table 4.15: Independent Samples t-Test for Post-Test Kidney Health Indicators

Group	N	Mean (mg/dL)	Std. Deviation (mg/dL)	t	df	Sig. (2-tailed)
Experimental	30	0.90	0.12	-3.57	58	0.001
Control	30	1.05	0.15			

4 Discussion

This study aimed to investigate the effects of moderate-level exercises on renal filtration function and kidney health indicators among cricket players. The results highlight important findings that enhance our understanding of the relationship between physical activity and kidney health. The significant reduction in urea levels observed in the experimental group post-intervention (from a mean of 32.5 mg/dL to 28.1 mg/dL) underscores the beneficial effects of moderate physical exercise on renal filtration function. Urea is a key marker of kidney function, and its levels can indicate how well the kidneys are filtering waste products from the blood. The statistically significant difference (t(58) = -3.23, p = 0.002) suggests that the intervention effectively enhanced the kidneys' ability to manage metabolic waste. This aligns with recent research indicating that regular physical activity can significantly improve renal function and reduce the risk of chronic kidney disease (Parker et al., 2022; Zhang et al., 2023). The study also assessed other kidney health indicators, revealing significant improvements for the experimental group (median of 0.90 mg/dL compared to 1.05 mg/dL in the control group) post-intervention (Mann-Whitney U = 320.0, z = -3.45, p = 0.001). This finding emphasizes that moderate exercise can enhance kidney function, which is vital for overall health, especially for athletes facing high physical stress. This is supported by recent findings suggesting that moderate-intensity aerobic exercise can lead to favorable changes in renal parameters and help in preventing renal damage (Sakaguchi et al., 2023). The lack of significant differences in pre-test measurements between the experimental and control groups for both urea levels and kidney health indicators (t(58) = 0.72, p = 0.475 for urea levels; t(58) = -1.06, p = 0.295 for kidney health indicators) establishes that both groups started from similar baselines. This homogeneity strengthens the reliability of the study, as any post-test differences can be more confidently attributed to the exercise intervention. Similar findings were reported by Jones et al. (2022), who noted that baseline equivalence in physical fitness levels allows for clearer attribution of changes to specific interventions. The correlation analyses revealed no significant relationships between age or playing experience and urea levels, both pre-test and post-test. This suggests that these demographic factors did not significantly influence kidney function outcomes in this specific sample. This finding contrasts with some studies that suggest older age may be associated with decreased renal function. However, the relatively young and homogenous sample of cricket players may limit the generalizability of these findings across different age groups or athletic backgrounds. The use of both parametric and non-parametric statistical tests adds robustness to the findings. The paired samples t-test showed a significant mean difference in urea levels within the experimental group (t (29) = 5.67, p = 0.000), reinforcing the conclusion that moderate exercise positively affects renal function. Furthermore, the Wilcoxon Signed-Rank Test for the control group indicated no significant change, emphasizing the effectiveness of the intervention.

5 Conclusion

The findings indicate that moderate-level exercise leads to a measurable improvement in kidney health, reflected by significant reductions in urea levels and better renal function indices in the experimental group. This suggests that regular, controlled exercise can play a beneficial role in supporting kidney function. Future studies should further explore the long-term effects of exercise on renal health and the underlying mechanisms responsible for these benefits.

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