

Research Article

Effects of moderate physical activity on HB level and psychological well-being in females – A randomized control trial

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ABSTRACT

Background: Physical activity reduce mortality and prevent many chronic diseases; it can promote healthy cognitive and psychosocial function. It is also important to understand the moderate physical activity's affects hemoglobin levels.

Objective: To determine the effects of moderate physical activity on HB level, and psychological well-being in females.

Methodology: A single blinded, randomized control trial was conducted on n=30 participants for a period of 6 months. The participants with the age 18-25 years were recruited through non-probability convenient sampling technique and randomly divided into two groups experimental and control group. The data was collected at the baseline after the six weeks of intervention. The outcome measures were Hb level and psychological wellbeing through perceived stress scale (PSS).

Results: The mean age of study participants was 19.59±1.32 years. While mean BMI of the participants was 24.22±3.43 kg/m². The result showed significant increase in hemoglobin concentrations in experimental group as compared to control group (p<0.001) after 6th week intervention. On the other hand, there were no significant differences between both group (p=0.63) at the end of intervention.

Conclusion: Moderate physical activity group suggests that the intervention had a positive impact on this hemoglobin parameter. However, since there were no significant differences in perceived stress levels.

Keywords: hemoglobin; brisk walking; psychological well-being; push-ups; sit ups; stress scale; physical fitness.

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INTRODUCTION

Anemia is a worldwide public health issue that affects people of all ages, although it is more common in young girls [1]. The females of reproductive age had iron deficiency anemia 50% worldwide. According to reports, anemia affects 50% of Pakistani women who are of reproductive age, and in Punjab, a province in Pakistan, 21% of women in the 9–29 age group also struggle with of life[4].

Physical activity reduce mortality and prevent many chronic diseases such as hypertension, diabetes, stroke, and cancer, it can promote healthy cognitive and psychosocial function [5]. The physical activity can stimulate erythropoiesis and increase red cell mass as well as plasma volume, resulting in increased blood volume reflect in increased hemoglobin concentration [6].

Regular physical activity, such as exercise and yoga, has been shown to improve mental health, particularly stress reduction. In addition to promoting social relationships, improving sleep, elevating cognitive performance, regulating neurotransmitters, and lowering the risk of diseases like depression and anxiety, it also contributes to long-term mental well-being.

Most of the literature showed that level of physical activity is associated with Hb level and stress. But there is paucity in the literature regarding the cause-and-effect relationship of PA on Hb and stress. Literature shows there is a lack in any defined physical activity, which can affect the Hb concentration and stress. Currently no study was found in Pakistan regarding effectiveness of Physical activity on Hemoglobin concentration in young female. Internationally there is also conflicting result about the effect of exercise in

anemia [3].It was also observed in a study that 33.4% of the students had anemia. However, a greater proportion of hostilities (39.2%) was discovered than among day scholars (23.1%) [1]. Anemia has been demonstrated to have an impact on mental health and learning abilities. It can also result in anger, exhaustion, trouble concentrating, weakness, and increased susceptibility to infection. Consequently, anemic patients may tend to be poor in quality increasing or decreasing Hb level [7]. So objective of the current study is to determine physical activity improving hemoglobin concentration and stress in young female.

METHODOLOGY

A single blinded, randomized controlled trial was conducted after taking approval from Research Ethical Review Committee of Riphah international University (RIPHAH/RCRS/REC/Letter-00929), at Fazaia Bilquis College of education for women, PAF Nur Khan, Rawalpindi Pakistan for a period of 6 months. The informed consent was taken prior to the study and in accordance with the Declaration of Helsinki. The inclusion criteria were undergraduate females with the age criteria of 18-25 years, who had hemoglobin level <12, and showed willingness to participate in the study. While participants were excluded with lower limb musculoskeletal injury, head Injury or trauma in past 6 months, any neurological or musculoskeletal condition and who had acute or chronic infections diseases.

Using a non-probability convenient sampling procedure, n=30 of the n=70 participants who were evaluated for inclusion criteria were found to meet the requirements. The participants were randomly assigned into experimental group (n = 15) and a control group (n = 15).

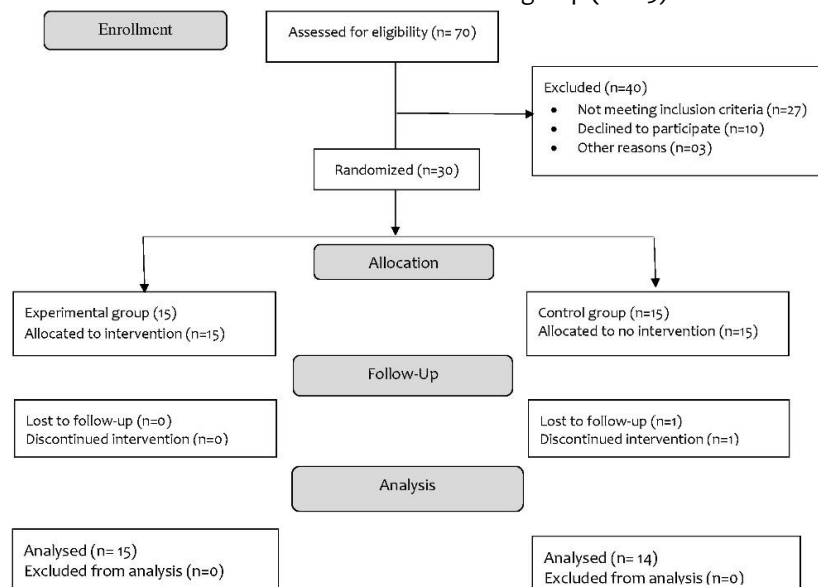


Figure 1: Consort diagram

The experimental group were given 30 minutes of brisk walking (moderate physical activity) along with the warmup and cool down exercises before and after the intervention, respectively. The duration of the intervention was 5 days a week for 6 continuous weeks. However the control group were advised to continue routine activities. The data was collected baseline and post interven after the six weeks. One (n=01) participant from the control group was anot appeared in the post assessment due to loss of followup. (Figure 1)

The randomization was done through sealed envelope method. It was a single blinded study, and to overcome the biasness the assessing researcher was unaware whether the participant was in experimental or control group.

The general demographic data including age and BMI was measured at baseline. BMI is divided

into four groups based on the Asian-Pacific cutoff points and is computed as weight in kilograms divided by height in meters squared (kg/m^2) [8]. The outcome measures were Hb level and psychological wellbeing. The Hb level was measured through Hb level test, and psychological wellbeing was measured through perceived stress scale [9]. The assumptions of parametric tests were met, thus for with-in group analysis paired sample t-test was used. While for between the group changes, independent t-test was used. The level of significance was set at $p < 0.05$ and SPSS version 22 was used to analyze the data.

RESULTS

The mean age of study participants was 19.59 ± 1.32 years. While mean BMI of the participants was $24.22 \pm 3.43 \text{ kg}/\text{m}^2$. The Distribution of BMI can be seen on figure 2.

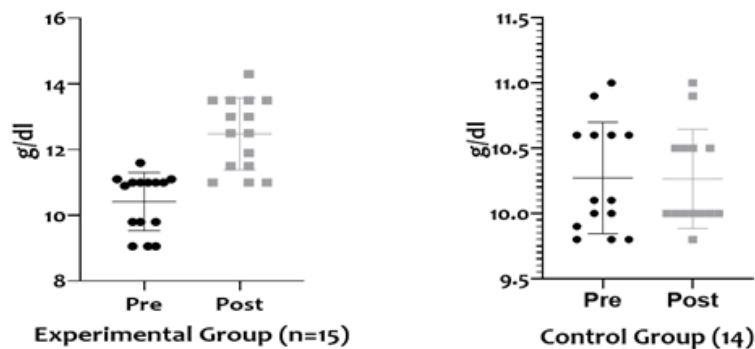
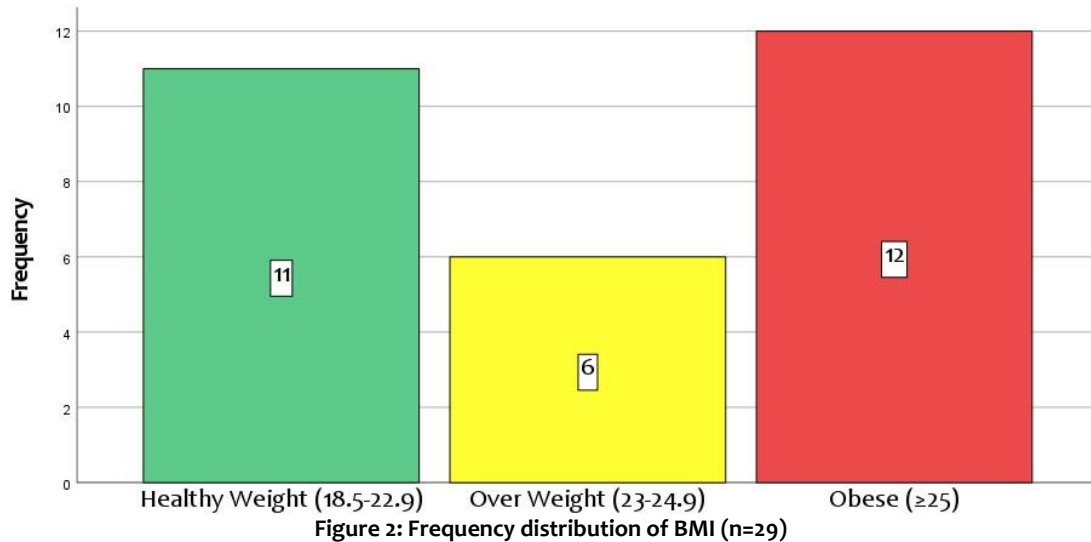


Figure 3: With-in group changes in hemoglobin level and Perceived Stress

The significant changes were observed in experimental group regarding pre-post analysis of hemoglobin level (10.41 ± 0.88 vs. 10.90 ± 0.42 , MD=-48, $p=0.02$) and perceived stress 25.4 ± 2.13 vs. 23.8 ± 3.54 , MD=-.19, $p=0.04$) after 6th week of

moderate physical activity. While in the control group no significant changes were observed in hemoglobin level (10.27 ± 0.42 vs. 10.26 ± 0.37 , MD= 0.6, $p=0.47$) and perceived stress (24.21 ± 2.88 vs. 24.50 ± 4.29 , MD=-.28, $p=0.86$). (Figure 3)

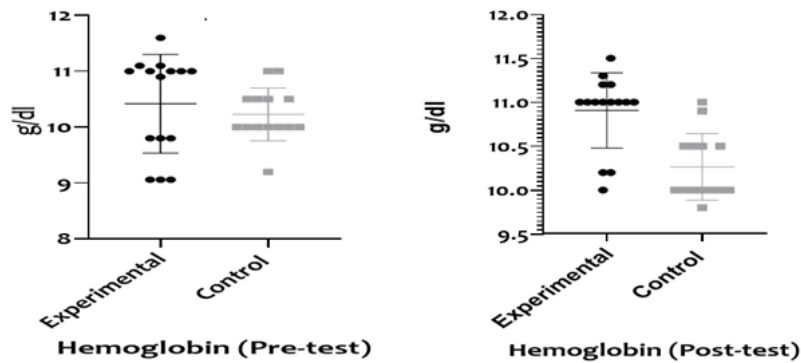


Figure 4: Comparing Hb level and Perceived Stress between groups.

As the data was comparable at the baseline, the result of independent t-test showed significant increase in hemoglobin concentrations in experimental group as compared to control group (10.91 ± 0.42 vs. 10.26 ± 0.37 , $MD = -.64$, $p < 0.001$) after 6th week intervention. On the other hand, there were no significant differences between both group after 6th week regarding perceived stress (23.8 ± 3.54 vs. 24.50 ± 4.29 , $MD = -.7$, $p = 0.63$) at the end of intervention. (Figure 4)

DISCUSSION

The purpose of the study was to determine the effects of moderate physical activity on Hb level, and mental health. According to the results of the study moderate physical activity i.e. brisk walk significantly improved Hb level, and mental health measured on perceived stress scale after 6-week of intervention.

In a recent study, moderate physical activity significantly improve hemoglobin level in blood which is in coherence with the previous study, which demonstrated that brisk walk for long duration improve hemoglobin status [10]. Previous studies reported if a person is involved in a physical activity, muscles work to manage the deficiency and balance the need of oxygen. Therefore, the capability of muscles leads to improve oxyhemoglobin that increase hemoglobin concentration [11, 12]. Another study reported physiological responses such as exercise induce the condition of hypoxia which increase the production of transcription factor. Thus, this mechanism leads to the excessive transportation of oxygen through blood via erythropoietin-mediated erythropoiesis [11, 12].

A study reported that aerobic exercise increased hemoglobin (Hb) concentration and hematologic factors in young females [13]. The increased Hb lead to increase oxygen carrying capacity and maximal oxygen capacity [14]. This is because the network or cell will need more oxygen when doing activities so that there is adaptation in binding oxygen in the blood [15]. But another study conducted on sedentary women suggest that

exercise reduce the red blood cells (RBC), hemoglobin (Hb), and hematocrit (HCT) in sedentary women [16-18].

Moreover, results of the recent study showed no significant improvement in mental health measured on perceived stress scale after 6-weeks of intervention of moderate physical activity. But previous study contradict the results of recent study in which brisk walk improves psychological health [19]. Psychological health can be improved by improving cognition and reducing depression and anxiety [20, 21]. However the exact mechanism of improved mental health in unclear but it is associated with neuro-protective effect of exercise. Moderate physical activity has a positive impact on mental health, lowering stress through the production of endorphins, elevating mood through the increase of serotonin and dopamine, and regulating cortisol. Long-term psychological benefits, social engagement, mind-body connection, improved sleep quality, and cognitive performance are all observed [22].

A few female students reported that during their most recent menstrual cycle, the severity of their dysmenorrhea had decreased. It is possible that moderate physical activity triggers the release of endorphins, which are endogenous analgesics that could effectively relieve menstrual cramps, lower stress levels, and thereby lessen menstrual discomfort while elevating mood. Regular physical exercise is also associated with improved general health, which may help to promote more regular menstrual period [22, 23].

This study is a pilot study with small sample size and single centered which limits the generalizability. Moreover, there is variation among the participants regarding the BMI, so can be interact as confounder and may affect the results.

CONCLUSION

The observed increase in hemoglobin concentrations in the experimental group suggests that the intervention had a positive impact on this hematological parameter. However, since there

were no significant differences in perceived stress levels between the experimental and control groups, more comprehensive study is necessary to better understand the underlying reasons impacting these outcomes, considering the reported observed changes in stress levels and hemoglobin levels.

DECLARATIONS & STATEMENTS

Author's Contribution

The following format should be used for author's contribution.

RK: substantial contributions to the conception and design of the study.

RK and QUA: acquisition of data for the study.

RK and QUA: interpretation of data for the study.

RK and QUA: analysis of the data for the study.

RK and QUA: drafted the work.

RK and QUA: revised it critically for important intellectual content.

RK and QUA: final approval of the version to be published and agreement to be accountable for all aspects.

of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted after taking approval from Research Ethical Review Committee of Riphah International University (RIPHAH/RCRS/REC/Letter-00929), at Fazaia Bilquis College of education for women, PAF Nur Khan, Rawalpindi Pakistan for a period of 6 months. The informed consent was taken prior to the study and in accordance with the Deceleration of Helsinki.

Consent Statement

Informed consent was obtained from all subjects involved in the study

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

None to declare.

Conflicts of Interest

None to declare.

Funding

None to declare.

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