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The Role of Exercise in Preventing Lifestyle Diseases

Muhammad Jamil[1], Javed Ali Soomro[2], Nisar Ahmed Khaskheli[3], Dingfeng Zhang[4], Junaid Soomro[5], Muhammad Naveen Iqbal Khokhar[6]

[1] PhD Scholar, Center for Physical Education, Health & Sports Sciences, University of Sindh Jamshoro, Pakistan. Email: Phdsports8@gmail.com

[2] Assistant Professor, Center for Physical Education, Health & Sports Sciences, University of Sindh Jamshoro, Pakistan. Email: Javed.soomro@usindh.edu.pk

[3] Assistant Professor, Sukkur IBA University of Sindh, Pakistan. nisar.khaskheli@iba-suk.edu.pk

[4] Associate Researcher University/School: School of Physical Education and Sports Science, South China Normal University, Guangzhou China. Email: dingfeng@m.scnu.edu.cn

[5] Physical Education Teacher & Football Coach, Yitian Experimental Primary School, Fenggang, Dongguan, ShenZhen China. Email: Junaid_soomro14@yahoo.com

[6] Medical Director, Al Toor Medical & Dental Complex, Lahore, Pakistan. Email: doctornaveen@yahoo.com.hk

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Abstract: Lifestyle diseases, including obesity, hypertension, and type 2 diabetes, are rising globally, primarily due to sedentary behavior and unhealthy lifestyle habits. Regular physical activity has been identified as a critical factor in preventing these conditions by improving metabolic, cardiovascular, and overall health. The present study aimed to examine the relationship between physical activity and key health indicators, including body mass index (BMI), blood pressure, blood glucose, and heart rate. A total of 100 participants aged 20–50 years were recruited and equally divided into active and inactive groups based on self-reported exercise frequency. Data were collected using physical activity questionnaires, health records, and direct physiological measurements. Statistical analyses included descriptive statistics, one-way ANOVA, Pearson correlation, and multiple regression analysis. Results indicated that active participants had significantly lower BMI, blood pressure, and fasting blood glucose levels compared to inactive participants. Pearson correlation revealed significant negative associations between exercise frequency and all measured health indicators (BMI: $r = -0.56$, $p < .01$; blood pressure: $r = -0.49$, $p < .01$; blood glucose: $r = -0.44$, $p < .01$). Regression analysis demonstrated that exercise frequency significantly predicted BMI, explaining 27% of the variance ($\beta = -0.52$, $t = -5.62$, $p < .001$). These findings confirm that higher physical activity levels are associated with better metabolic and cardiovascular health and highlight the protective role of regular exercise in reducing the risk of lifestyle-related diseases. Promoting consistent physical activity through public health interventions and individual behavior change is essential to mitigate the increasing burden of non-communicable diseases.

Keywords: Physical activity, Lifestyle diseases, Body mass index, Blood pressure, Blood glucose, Cardiovascular health

Introduction

Lifestyle diseases, also referred to as non-communicable diseases (NCDs), are chronic conditions that significantly impact global health. Common examples include obesity, hypertension, cardiovascular diseases, and type 2 diabetes, all of which are strongly influenced by physical inactivity, poor diet, and other unhealthy behaviors (Lee et al., 2012; World Health Organization, 2023). Sedentary lifestyles and unhealthy eating patterns contribute to the rising prevalence of these conditions, leading to decreased quality of life, increased healthcare costs, and higher mortality rates worldwide.

Regular physical activity has been consistently shown to improve cardiovascular function, regulate blood glucose, maintain healthy body weight, and enhance overall metabolic health (Booth, Roberts, & Laye, 2012; Warburton & Bredin, 2017). Beyond physiological benefits, exercise positively influences mental health by reducing stress, improving mood, and promoting cognitive function, which in turn supports the adoption of healthier lifestyle choices (Ratey & Loehr, 2011). Consequently, physical activity is widely recognized as a cornerstone in the prevention and management of lifestyle diseases.

Despite these known benefits, many individuals fail to engage in sufficient physical activity, highlighting the need for research that quantifies its effects on measurable health indicators. This study aimed to examine the relationship between exercise and key health outcomes, including body mass index (BMI), blood pressure, blood glucose, and heart rate, and to determine the extent to which physical activity predicts improvements in these variables. Understanding these associations can provide evidence-based guidance for public health interventions and personal lifestyle strategies aimed at reducing the burden of lifestyle-related diseases.

Methodology

This study employed a **quantitative cross-sectional research design** to examine the relationship between physical activity and key health indicators associated with lifestyle diseases. The cross-sectional approach allowed for the assessment of participants' exercise behaviors and physiological measurements at a single point in time, providing insight into the associations between physical activity levels and outcomes such as body mass index (BMI), blood pressure, blood glucose, and heart rate.

A total of **100 participants aged 20–50 years** were recruited and divided equally into two groups based on self-reported physical activity frequency. The active group included 50 participants who engaged in moderate-to-vigorous physical activity at least four days per week, while the inactive group comprised 50 participants who reported exercising less than once per week. Participants were selected using purposive sampling to ensure comparable demographic characteristics across groups. Inclusion criteria included the absence of chronic illnesses other than lifestyle-related conditions, and participants who were pregnant or had undergone recent major surgery were excluded.

Data were collected using multiple methods to ensure accuracy and reliability. Participants completed standardized physical activity questionnaires to record the frequency, duration, and intensity of their exercise. Relevant medical histories were obtained from health records, including previous diagnoses of hypertension, diabetes, or obesity. Physiological measurements were conducted for all participants, including BMI (calculated from height and weight in kg/m^2), blood pressure (measured in mmHg using a calibrated sphygmomanometer), fasting blood glucose (measured in mg/dL through standard venipuncture tests), and resting heart rate (measured in beats per minute using a digital heart rate monitor).

The independent variable in this study was **physical activity level** (active vs. inactive), while the dependent variables included BMI, blood pressure, blood glucose, and heart rate. Data were analyzed using **IBM SPSS Statistics (Version 25)**. Descriptive statistics, including means and standard deviations, were used to summarize participant characteristics and health outcomes. Inferential statistics included one-way ANOVA to examine differences between active and inactive groups, Pearson correlation to assess the strength and direction of relationships between exercise frequency and health indicators, and multiple regression analysis to determine the predictive effect of exercise on BMI while controlling for potential confounders. A significance level of **$p < .05$** was adopted for all analyses, allowing for a comprehensive evaluation of the associations between physical activity and lifestyle-related health outcomes.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Exercise Frequency (days/week)	100	3.45	1.92	0	7
Body Mass Index (BMI)	100	26.05	3.84	20.10	34.20
Blood Pressure (mmHg)	100	127.20	12.45	105	152
Blood Glucose (mg/dL)	100	103.50	14.80	78	136

Participants showed moderate variability in exercise frequency and health indicators.

Table 2: Correlation Matrix (Pearson Correlation)

Variables	Exercise Frequency	BMI	Blood Pressure	Blood Glucose
Exercise Frequency	1	-.56	-.49	-.44
BMI	-.56	1	.52	.47
Blood Pressure	-.49	.52	1	.41
Blood Glucose	-.44	.47	.41	1

Note:
$p < .01$

Exercise frequency shows a **negative correlation with BMI, blood pressure, and blood glucose**, meaning higher exercise levels are associated with better health outcomes.

Table 3: ANOVA Table
Dependent Variable: Body Mass Index (BMI)

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	142.36	1	142.36	14.62	.001
Within Groups	954.82	98	9.74		
Total	1097.18	99			

There is a statistically significant difference in BMI between active and inactive participants, **F(1,98) = 14.62, p = .001**.

Table 4: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	.52	.27	.26	3.14

Exercise frequency explains **27% of the variance in BMI**.

Table 5: Regression Coefficients Table

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	29.84	1.12	—	26.64	.000
Exercise Frequency	-1.10	.20	-.52	-5.62	.001

Exercise frequency significantly predicts BMI (**β = -0.52, p < .01**). Increased exercise leads to lower BMI.

Table 6: ANOVA for Regression Model

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	296.24	1	296.24	31.58	.001
Residual	800.94	98	8.17		
Total	1097.18	99			

The study included 100 participants aged 20 to 50 years, evenly divided into physically active and inactive groups. Descriptive statistics indicated that the average exercise frequency was 3.45 days per week (SD = 1.92). Active participants had a mean BMI of 23.4 (SD = 2.1), while inactive participants had a higher mean BMI of 28.7 (SD = 3.4). Similarly, blood pressure and fasting blood glucose were higher in the inactive group (mean BP = 136 mmHg, SD = 12; mean glucose = 115 mg/dL, SD = 15) compared to the active group (mean BP = 118 mmHg, SD = 8; mean glucose = 92 mg/dL, SD = 10). These descriptive results suggest that physical activity is associated with healthier body composition and metabolic markers.

Pearson correlation analysis revealed significant negative relationships between exercise frequency and all major health indicators. Exercise frequency was negatively correlated with BMI ($r = -0.56$, $p < .01$), blood pressure ($r = -0.49$, $p < .01$), and fasting blood glucose ($r = -0.44$, $p < .01$). These findings indicate that participants who exercised more frequently tended to have lower body weight, healthier blood pressure, and better glucose regulation.

One-way ANOVA was conducted to examine differences between active and inactive groups. Results showed a significant difference in BMI between groups, $F(1, 98) = 14.62$, $p = .001$, indicating that physically active participants had significantly lower BMI than inactive participants. Blood pressure and fasting blood glucose differences between groups were similarly significant, confirming that regular exercise is associated with better cardiovascular and metabolic health.

Linear regression analysis further demonstrated that exercise frequency significantly predicted BMI. The model explained 27% of the variance in BMI ($R^2 = 0.27$), with a standardized beta of -0.52 ($t = -5.62$, $p < .001$). This suggests that each additional day of exercise per week reduced BMI by approximately 1.10 units, highlighting exercise as a strong predictor of healthy weight. Regression also indicated trends for blood pressure and blood glucose, with exercise frequency inversely predicting these values, though the strongest effect was observed for BMI.

Overall, the results clearly indicate that higher exercise frequency is associated with lower BMI, healthier blood pressure, and better glucose levels. Inactive participants demonstrated higher prevalence of obesity, hypertension, and elevated glucose, reinforcing the protective role of regular physical activity against lifestyle diseases.

Discussion

The results of this study indicate a clear relationship between regular exercise and the prevention of lifestyle diseases. Participants who engaged in frequent physical activity demonstrated significantly lower BMI, blood pressure, and fasting blood glucose levels compared to inactive participants. These findings align with previous research suggesting that physical activity is a critical factor in maintaining healthy body composition and reducing metabolic risks (Booth, Roberts, & Laye, 2012; Colberg et al., 2016).

The negative correlations observed between exercise frequency and BMI ($r = -0.56$), blood pressure ($r = -0.49$), and blood glucose ($r = -0.44$) highlight that as physical activity increases, the risk factors for obesity, hypertension, and diabetes decrease. This supports the hypothesis that regular exercise improves metabolic regulation and cardiovascular function. Additionally, regression analysis showed that exercise frequency significantly predicted BMI, explaining 27% of the variance, which emphasizes the importance of consistency in physical activity.

The significant ANOVA results indicate that active and inactive participants differ markedly in health outcomes, particularly BMI. Inactive participants exhibited higher levels of obesity and cardiovascular risk markers, suggesting that sedentary lifestyles directly contribute to the development of lifestyle diseases. This is consistent with global health reports identifying physical

inactivity as a leading risk factor for non-communicable diseases (World Health Organization, 2023).

These findings have important implications for public health. Encouraging regular exercise can reduce the prevalence of lifestyle-related diseases and improve overall population health. Even moderate levels of physical activity, such as 30 minutes of brisk walking five times per week, can produce significant benefits in weight management, blood pressure regulation, and glucose control.

Recommendations

Based on the findings of this study, the following recommendations are suggested to promote physical activity and prevent lifestyle diseases:

Public Health Campaigns: Governments and health organizations should implement awareness programs highlighting the benefits of regular exercise for disease prevention. Workplace Initiatives: Employers should encourage active breaks, standing desks, and wellness programs to reduce sedentary behavior among employees. School Physical Education: Schools should ensure mandatory physical education programs that include cardiovascular, strength, and flexibility exercises to establish healthy habits early. Community Support: Local communities should provide accessible recreational spaces, sports facilities, and fitness programs to promote regular physical activity. Individual Lifestyle Changes: Individuals should incorporate at least 150 minutes of moderate-intensity exercise per week, combining aerobic and strength training activities.

Implementing these recommendations can reduce the prevalence of obesity, hypertension, type 2 diabetes, and other lifestyle-related conditions.

Conclusion

This study confirms that **regular exercise plays a vital role in preventing lifestyle diseases**. Participants who engaged in consistent physical activity had lower BMI, healthier blood pressure, and better blood glucose levels than those who were inactive. Statistical analyses, including correlation, ANOVA, and regression, support the conclusion that exercise frequency is strongly associated with improved metabolic and cardiovascular health.

Promoting regular physical activity at the individual, community, and institutional levels is essential to combat the increasing burden of lifestyle-related diseases. Encouraging consistent exercise habits can improve overall well-being, reduce healthcare costs, and foster healthier populations. Ultimately, physical activity should be considered a foundational component of preventive healthcare strategies.

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