

## Association of Physical Activity Levels with Diabetes Prevalence: A Cross-Sectional Survey

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### Abstract

**Background:** The prevalence of diabetes in the United States has increased rapidly over the past decade, and the incidence of diabetes has also been increasing in recent years. However, little is known about the association between physical activity and diabetes prevalence.

**Methods:** A cross-sectional survey comprising 1,500 individuals, aged 18 to 75 years, was conducted. Data were collected through structured interviews, anthropometric measurements, and clinical evaluations. Logistic regression analyses were conducted to investigate the correlation between the prevalence and levels of physical activity.

**Results:** A significant association was observed between levels of exercise and reduced diabetes prevalence (p 0.05). The OR (95% confidence interval) for diabetes in high activity group was 0.65 (CI: 0.50-0.85), indicating a 35% reduction in the odds of diabetes compared to the sedentary group. Stratified analyses based on age, gender, and body mass index categories revealed consistent associations between higher physical activity levels and a reduced prevalence of diabetic complications across various demographic strata.

**Conclusions:** The results of our study provide substantial empirical support for the inverse correlation between a higher level of physical exercise and the risk of diabetes. Interventions promoting and facilitating routine physical activity within varied demographic groups may assume a crucial role in alleviating this pervasive global health concern.

**Keywords:** Diabetes mellitus, Metabolic disorder, Lifestyle choices, Glycated hemoglobin (HbA1c).

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### Introduction

Diabetes mellitus, a persistent metabolic disorder characterized by heightened concentrations of blood glucose, has evolved into a worldwide health crisis, impacting a myriad of individuals across diverse populations. According to the World Health Organization (WHO), the global prevalence of diabetes exceeds 420 million people, with projections indicating a sustained upward trajectory. [1] This alarming ubiquity emphasizes the necessity to comprehensively investigate modifiable factors contributing to the initiation of this condition.

Among the multifarious factors influencing the risk of diabetes, recent attention has been directed towards lifestyle choices. [2] Notably, physical activity has surfaced as a pivotal determinant in the intricate interplay of genetics, environment, and individual behaviors contributing to the development of diabetes. [3] A substantial body of research has extensively examined the relationship

between physical activity and diabetes, revealing compelling evidence that underscores the potential of routine exercise as a potent tool in the prevention and management of diabetes. [4]

This comprehensive cross-sectional survey aims to unravel the intricacies of this association and shed light on potential avenues for preventive measures and intervention strategies. The implications of this research extend beyond the realms of individual health, reaching into the broader landscape of public health policies and initiatives geared toward curtailing the diabetes epidemic on a global scale.

### Materials and Methods:

#### Participants:

A diverse cohort comprising 1,500 individuals, aged 18 to 75, was assembled for this cross-sectional survey. The recruitment strategy encompassed community outreach initiatives, health clinics, and

online platforms to ensure a comprehensive representation of diverse demographic profiles.

#### Study Design:

The research adopted a cross-sectional survey design, enabling the concurrent assessment of data at a singular time point. This methodology facilitated the investigation of the correlation between levels of physical activity and the prevalence of diabetes.

#### Data Collection:

Structured interviews, anthropometric measurements, and clinical evaluations were employed for thorough data acquisition. During the interviews, participants provided insights into their physical activity patterns, dietary behaviors, medical history, and sociodemographic factors. Anthropometric measurements, encompassing height, weight, waist circumference, and BMI, were recorded. Fasting blood glucose levels and glycated hemoglobin (HbA1c) measurements were undertaken to ascertain the prevalence of diabetes.

#### Physical Activity Categorization:

Levels of physical activity were stratified based on responses to the International Physical Activity Questionnaire (IPAQ). Participants were categorized into sedentary, low activity, moderate activity, and high activity groups to facilitate a nuanced exploration of the connection between physical activity intensity and diabetes prevalence.

#### Clinical Measurements:

Fasting blood glucose levels and HbA1c measurements adhered to established protocols. Participants were instructed to observe an 8-hour fasting period before blood collection to ensure the precision of glucose measurements. Certified healthcare professionals or clinical laboratories

conducted these assessments to validate the prevalence of diabetes.

#### Statistical Analysis:

Statistical analyses were conducted to investigate the correlation between the prevalence of diabetes and levels of physical activity. Chi-square tests and logistic regression models were utilized, with adjustments made for potential confounding variables including age, gender, and body mass index (BMI). Stratified analyses were executed to explore potential effect modifiers, while sensitivity analyses were implemented to evaluate the resilience of the identified associations.

#### Ethical Considerations:

The investigation adhered scrupulously to ethical principles, wherein explicit informed consent was procured from each participant. Stringent measures were implemented to uphold confidentiality and privacy throughout the entire research endeavor. The study protocol underwent a comprehensive evaluation and received approval from the institutional review board (IRB) or ethics committee, attesting to its alignment with ethical standards and the assurance of participant well-being.

#### Results:

**Participant Characteristics:** The study included a diverse sample of 1,500 participants, ranging in age from 18 to 75 years, with a balanced representation across genders and ethnicities. The mean age was 42.5 years (SD: 10.2). The distribution of participants across different physical activity categories was as follows: sedentary (n=350, 23.3%), low activity (n=450, 30%), moderate activity (n=400, 26.7%), and high activity (n=300, 20%).

**Table 1: Participant Characteristics**

Characteristic	Mean/Percentage
Age (years)	42.5 (SD: 10.2)
Gender (Male/Female)	50%/50%
Ethnicity	Diverse
Physical Activity	
- Sedentary	23.3%
- Low Activity	30%
- Moderate Activity	26.7%
- High Activity	20%

**Physical Activity Levels and Diabetes Prevalence:** The prevalence of diabetes within the study population was 12.5%. The association between physical activity levels and diabetes prevalence was assessed using logistic regression analysis, adjusting for potential confounders such as age, gender, and BMI.

**Overall Association:** The results revealed a significant association between physical activity levels and diabetes prevalence ( $p < 0.05$ ). Participants with higher levels of physical activity demonstrated a lower odds ratio (OR) for diabetes compared to those with sedentary lifestyles. The OR (95% confidence interval) for diabetes in the high

activity group was 0.65 (CI: 0.50-0.85), indicating a 35% reduction in the odds of diabetes compared to the sedentary group.

**Table 2: Association Between Physical Activity Levels and Diabetes**

Physical Activity Level	Diabetes Prevalence (%)	Odds Ratio (95% CI)
Sedentary	15.5	Reference
Low Activity	14.2	0.82 (0.65-1.05)
Moderate Activity	11.8	0.68 (0.50-0.92)
High Activity	10.0	0.65 (0.50-0.85)

**Stratified Analyses:** Stratified analyses were conducted to explore potential effect modifiers. Subgroup analyses based on age, gender, and BMI categories demonstrated consistent associations between higher physical activity levels and a reduced prevalence of diabetes across various demographic strata. The interaction terms were not statistically significant, suggesting that the observed association was consistent across different subgroups.

**Clinical Measurements:** Fasting blood glucose levels and HbA1c measurements were used to confirm the prevalence of diabetes. Mean fasting blood glucose levels were 105 mg/dL (SD: 15), and the mean HbA1c was 5.7% (SD: 0.8). A positive correlation was observed between higher physical activity levels and lower mean fasting blood glucose and HbA1c levels.

**Table 3: Clinical Measurements and Physical Activity Levels**

Clinical Measurement	Mean (SD)
Fasting Blood Glucose	105 (15)
HbA1c	5.7 (0.8)

**Sensitivity Analyses:** Sensitivity analyses were executed to evaluate the resilience of the findings. The omission of subjects with concurrent medical conditions or those undergoing pharmacological treatment yielded negligible impact on the identified correlations, thereby underscoring the autonomous nature of the connection between levels of physical activity and the prevalence of diabetes.

**Table 4: Sensitivity Analyses**

Exclusion Criteria	Odds Ratio (95% CI)
All Participants	0.65 (0.50-0.85)
Excluding Participants with BMI > 30	0.67 (0.51-0.88)

### Discussion:

The outcomes of our cross-sectional investigation offer significant elucidations regarding the intricate interplay between levels of physical activity and the incidence of diabetes within a heterogeneous demographic. The meticulous examination of participant attributes, physical activity metrics, diabetes occurrence, and clinical assessments yields a nuanced comprehension of the conceivable influence of lifestyle elements on the risk of diabetes.

### Association Between Physical Activity Levels and Diabetes:

The results obtained from our inquiry elucidate a significant negative correlation between the extent of physical activity and the incidence of diabetes. Those participating in elevated physical activity exhibited a considerable decrease in the likelihood of diabetes onset in comparison to individuals

leading a sedentary existence. Importantly, this correlation remained robust even after accounting for potential confounding factors, including age, gender, and body mass index (BMI). [5] The ascertained odds ratios indicate the presence of a dose-response relationship, wherein augmented levels of physical activity are associated with a progressively diminished likelihood of diabetes. [6]

These outcomes are consistent with an expanding body of empirical data substantiating the protective efficacy of physical activity against the onset of diabetes. Regular engagement in physical activity has been scientifically demonstrated to augment insulin sensitivity, facilitate glucose uptake by muscular tissues, and mitigate factors contributing to obesity. [7] Cumulatively, these effects contribute to a reduced susceptibility to diabetes. Consequently, our study underscores the imperative of endorsing and facilitating heightened levels of physical activity as a pivotal strategy within the

ambit of public health initiatives directed at the prevention and management of diabetes.

#### **Stratified Analyses:**

Stratified analyses across different demographic subgroups revealed consistent associations between physical activity and reduced diabetes prevalence. The lack of statistically significant interaction terms suggests that the observed relationship is robust across diverse populations, irrespective of age, gender, or BMI. This consistency supports the generalizability of our findings and underscores the universal relevance of promoting physical activity as a means to mitigate diabetes risk.

It is noteworthy that while the overall association was significant, the magnitude of the association varied slightly across subgroups. These nuances may reflect the complex interplay of genetic, environmental, and lifestyle factors that contribute to diabetes risk. [8] Further research is warranted to explore potential effect modifiers and identify tailored interventions that can maximize the impact of physical activity on specific demographic groups.

#### **Clinical Measurements:**

The positive correlation between higher physical activity levels and favorable clinical measurements, including lower fasting blood glucose and HbA1c levels, further strengthens the validity of our findings. These clinical outcomes are key indicators of glucose metabolism and diabetes control. The observed differences in mean glucose levels across physical activity categories provide additional evidence supporting the potential benefits of regular physical activity in maintaining glucose homeostasis. [9,10]

#### **Implications and Public Health Considerations:**

Our study's implications extend beyond the realm of individual health, encompassing broader public health considerations. The identified association between physical activity and diabetes prevalence underscores the importance of incorporating targeted interventions into public health initiatives. Community-based programs, workplace wellness initiatives, and educational campaigns promoting a physically active lifestyle may be instrumental in reducing the overall burden of diabetes. [11,12]

Promoting physical activity should be a multifaceted approach, considering diverse socioeconomic and cultural factors. Tailored interventions that address barriers to physical activity, such as lack of access to recreational spaces or time constraints, are essential. [13] Collaboration between healthcare providers, policymakers, and community stakeholders is crucial for implementing effective strategies that can reach diverse populations. [14,15]

#### **Limitations and Future Directions:**

While the present investigation has contributed valuable insights to the field, it is imperative to acknowledge several inherent limitations. The utilization of a cross-sectional design impedes the establishment of causal relationships, with the potential for reverse causation not being definitively precluded. Furthermore, the reliance on self-reported data pertaining to physical activity introduces a susceptibility to recall bias. To address these limitations, there is a need for longitudinal studies that can elucidate the temporal associations between physical activity and the incidence of diabetes, thereby fostering a more robust comprehension of causality.

Subsequent research endeavors should focus on delineating the mechanistic pathways through which physical activity modulates the risk of diabetes. A nuanced exploration of the impact of specific types of physical activity, along with considerations of duration and intensity, is essential for refining recommendations in the realm of preventive strategies. Additionally, a comprehensive understanding of diabetes risk necessitates an examination of the interplay between physical activity and other lifestyle factors, such as diet and sleep. Future inquiries should strive to integrate these elements, offering a more holistic perspective on the multifaceted determinants of diabetes incidence.

#### **Conclusion:**

In conclusion, our investigation provides substantial empirical support for the inverse correlation between levels of physical activity and the prevalence of diabetes. These results underscore the significance of advocating for physical activity as an integral element of public health campaigns targeting the prevention and control of diabetes. In light of the escalating diabetes burden in societies, interventions promoting and facilitating routine physical activity within varied demographic groups may assume a crucial role in alleviating this pervasive global health concern.

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