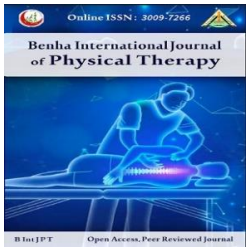
Benha International Journal of Physical Therapy

Online ISSN: 3009-7266 Home page: https://bijpt.journals.ekb.eg/



Original research

Comparison of activity level between normal adolescent and adolescent receiving penicillin injection post rheumatic fever: a case control study.

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Article history:
Submitted: 02-02-2024
Revised: 26-03-2024
Accepted: 26-03-2024

Abstract

Background: Physical activity level hinders all patients' ability to participate in physical therapy practices. However, physical therapists might benefit from knowledge about different patient groups' activity levels when implementing physical therapy programs. **Purpose:** to compare the activity level of adolescents with a history of rheumatic fever and receiving penicillin injections with normal adolescents. **Methods:** This case control study was conducted on sixty adolescents, divided into two groups: group 1 (thirty normal adolescents) and group 2 (thirty adolescents receiving penicillin as prophylactic management at an outpatient clinic of the National Heart Institute). All participants were asked to answer the International Physical Activity Questionnaire-Short Form (IPAQ-SF) in order to evaluate their physical activity level. **Results:** A non-significant difference was found when comparing the means of groups 1 and 2 in age (p-value = 0.48), weight (p-value = 0.48), and height (p-value = 0.09). The Pearson chi square test showed a non-significant difference was found between male and female distribution within groups 1 and 2 (p-value = 0.79). Significant differences were detected in the physical activity category distribution within groups 1 and 2 (p-value = 0.007). A non-parametric test (Mann-Whitney U test) showed a significant difference between group 1 and group 2 in MET-min per week (p-value = 0.0001). **Conclusion:** Activity level in adolescents with a history of rheumatic fever and receiving penicillin injection is lower than activity level in normal adolescents, so physical therapists should consider the physical activity level of adolescents who had rheumatic fever and received penicillin injection during evaluation and treatment as their activity level is significantly lower than average.

Keywords: Adolescent, Penicillin injection, Physical activity, Rheumatic fever.

Introduction

Rheumatic fever is an inflammatory disease that can result from a streptococcal infection. It can cause a variety of symptoms, but common ones include fever, joint pain and swelling, chest pain, shortness of breath, fatigue, and rash. Other symptoms include a feeling of discomfort and involuntary movements, like jerking or twitching of the arms, legs, or face. If you or someone you know has experienced any of these symptoms, especially if they have recently had a streptococcal infection, it's important to visit a doctor. Early diagnosis and treatment of rheumatic fever can

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help prevent serious complications like rheumatic heart disease.[1]

Penicillin injections are an important component in the management of rheumatic fever. They are used for both secondary prophylaxes to prevent recurrences and as a treatment for acute rheumatic fever. For secondary prophylaxis, injections of benzathine benzylpenicillin G every four weeks are the suggested regimen.[2]

Adherence to this regimen is crucial for its effectiveness, and studies have shown that the adherence rate to monthly penicillin injections is high among patients with rheumatic heart disease.[3] However, some patients may experience injection pain, which can affect their adherence to the treatment.[4] Adverse reactions to penicillin injections, including anaphylaxis, have been reported but are rare.[5]

Overall, penicillin injections play a vital role in preventing the development of rheumatic heart disease from acute rheumatic fever and have to be carried out in tandem with an all-encompassing management strategy.

The validity and reliability of the International Physical Activity Questionnaire short form (IPAQ-SF) have been investigated in a variety of demographics. Numerous investigations have evaluated the IPAQ-SF's validity, reliability, and cultural adaptability across linguistic and demographic contexts. These studies suggest that the IPAQ-SF is a valid and reliable tool for assessing physical activity levels in different populations.[5-8]

The International Physical Activity Questionnaire (IPAQ) short form in Arabic has undergone validation and been determined to be dependable. A study conducted on 624 Saudi Arabian university students participated in the study, which contrasted the Arabic SBQ with the IPAQ abbreviation. The findings demonstrated criterion and constructive validity, as well as strong correlations between the Arabic SBQ and the IPAQ's sitting time measurements.[9]

While physical activity has no discernible effect on the course of rheumatic heart disease, it can negatively impact patients' well-being when their activities are limited. [10] Physical activity plays a crucial role in overall health and well-being, particularly for individuals recovering from illnesses like rheumatic fever. Engaging in regular exercise can help improve cardiovascular health, strengthen muscles, and boost mood.

Although several research works examined the activity level in different population only one study which involving 216 rheumatic fever patients highlighted that imposing restrictions on asymptomatic patients may not prevent cardiac deterioration and may cause adverse psychological effects. The current study compared the activity level of adolescents with a history of rheumatic fever and receiving penicillin injections versus normal adolescents.[10-13]

In this current study our aim is to compare between the physical activity level in normal adolescents and in those who received penicillin injection as prophylaxis post rheumatic fever and our hypothesis is that the physical activity level in normal people is higher than those receive penicillin injection.

Methods

Study design, setting, and ethics

This study is case control study that includes 60 participants aged between 15 and 17 years were included in this study and equally divided into two groups. Group 1 included 30 normal adolescents and group 2 included 30 adolescents with history of rheumatic fever who receive penicillin injection with no cardiac complication to rheumatic fever. All adolescents selected from Al-liwaa Official language school National heart institute over 3 months from 1st day of January 2023 till March 31, 2023. This study protocol has been approved by The Cairo University Faculty of Physical Therapy has received permission (P.T.REC/012/003063). Parents' or guardians' informed consent was acquired.

Sample size calculation

Based on the pilot study findings, which provided an initial estimate of the effect size, we set the effect size (d) to 1. This value reflected the observed differences between the groups and helped us determine a more accurate sample size for our main study. In addition, we maintained a significance level (α) of 0.05 and a desired statistical power ($1-\beta$) of 0.95, ensuring appropriate sensitivity to detect the anticipated effect size.

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Considering the pilot study data and the input parameters mentioned above, we conducted the sample size calculation using G-Power Version 3.1.9.4. The output provided a non-centrality parameter (δ) value of 3.7, a critical t-value of 2.005, and approximately 53.386 degrees of freedom (df). Based on these calculations, G-Power recommended a sample size of 30 for each group, resulting in a total sample size of 60 participants.

Procedures:

Informed written consent was given by parent or guardians after that the age, weight and height were taken before they answer the Short Form version of the International Physical Activity Questionnaire (IPAQ). According to outcome of several studies as mentioned earlier IPAQ-SF valid and reliable for assessing physical activity levels in different populations.[5-8]

IPAQ is a tool primarily intended for adult population surveillance. Adults (ages 15 to 69) are the target audience for the development and testing of this product. IPAQ assesses physical activity undertaken across a comprehensive set of domains including leisure time, domestic and gardening (yard) activities, work-related and transport-related activity. Three particular activity kinds are included in the three domains mentioned above and sitting, according to the IPAQ short form. Walking, moderate-intensity exercises, and vigorous-intensity exercises are the specific activity kinds that are evaluated; frequency (measured in days per week) and duration (minutes per day) are gathered individually for each specific activity type. In order to describe the overall degree of activity, the items were designed to provide distinct scores for walking, moderate-intensity, and vigorous-intensity activities and a combined total score.

Walking, moderate-intensity, and vigorous-intensity exercise duration and frequency (measured in days) must be added together to calculate the overall score. Multiplying the MET score by the total minutes spent is how a MET-minute is determined. Kilocalories are equal to MET-minute scores for an individual weighing 60 kg. The values of 3.3 METs for walking, 4.0 METs for moderate PA, and 8.0 METs for vigorous PA are still used in the IPAQ data analysis. On IPAQ-SF, two primary findings can `be obtained. Walking + Moderate + Vigorous MET-min/week scores was added up together to calculate the total physical activity MET-min/week. The formulas for calculating MET-minutes/week are as follows: 3.3 * walking minutes * walking "days," 4.0 * moderate-intensity activity minutes * moderate days, and 8.0 * vigorous-intensity activity minutes * vigorous-intensity.

Additionally, categorical results might be found as Low if neither moderate nor vigorous, with moderate meeting the subsequent requirements. A minimum T=total physical activity of at least 600 MET-minutes/week can be achieved by engaging in walking, moderate-intensity activity, or vigorous-intensity activity for three or more days; or walking for at least thirty minutes on five days. and high if the subsequent conditions are met at least three days of intense exercise (20 minutes minimum, achieving a minimum of 1500 MET-minutes of total physical activity per week or seven or more days of any combination of walking, moderate-to-intense, or vigorous-intense exercise to reach a minimum of 3000 MET-minutes per week of total physical activity.[14]

Statistical analysis:

All data was analyzed by using SPSS 18 descriptive statistics including mean, standard deviation, frequency table, cross table and median. The independent t test was used to compare means of age, weight and height between two groups. Pearson chi-square used to test difference in gender and physical activity category distribution between two groups. TO compare between two groups in total MET*min/week (Mann-Whitney U Test) was used to investigate median difference as the data was found to be not normally distributed as tested by Shapiro-Wilk test.

Results

Figure 1 and table 1 showed the demographic characteristics in Groups 1 and 2, non-significant difference was found between group 1 and 2 in age (p =0.48), weight (p = 0.41) and height (p = 0.09).

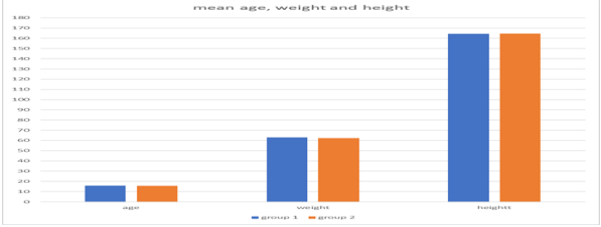

Figure 1: Age, weight and height

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Table 1: Demographic data of the sample				
	Group (n)	Mean	SD	P-value
Age	Group 1 (30)	15.78	0.36	0.48
	Group 2 (30)	15.63	0.46	
Weight	Group 1 (30)	62.92	6.42	0.41
	Group 2 (30)	62.2	5.85	
Height	Group 1 (30)	164	4	0.09
	Group 2 (30)	164	3	

n: number of cases, SD standard deviation, Significance level at p-value = 0.05. age in years, weight in kilogram, height in centimeter.

Table 2 and figure 2 explore the gender distribution within Group 1 and Group 2. The results reveal that there is no statistically significant difference between group 1 and 2 in male and female distribution, as p value= 0.787.

Table 2: Gender distribution within and between groups				
Groups (n)	Gender		Pearson Chi-Square	P-value
	Male n (%)	Female n (%)		
Group 1 (30)	19 (63.3)	11 (36.7)	0.073	0.79
Group 2 (30)	20 (66.7)	10 (33.3)		

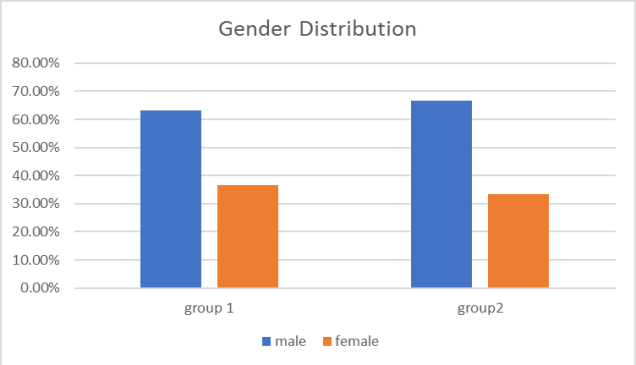

Figure 2: Gender distribution within and between groups

Table 3 and figure 3 show MET minutes across group 1 and group 2, significant difference between both groups was found (p value =0.0001).

Table 3: Comparison of MET-min per week between group 1 and 2							
Variable	Groups (n)	n	Median	1ST Quartile	3RD Quartile	Mann-Whitney U test	P-value
Met-minutes per week	Group 1	30	2079	1639.5	2597.25	128	0.0001
	Group 2	30	1262.35	1161.45	1406.75		

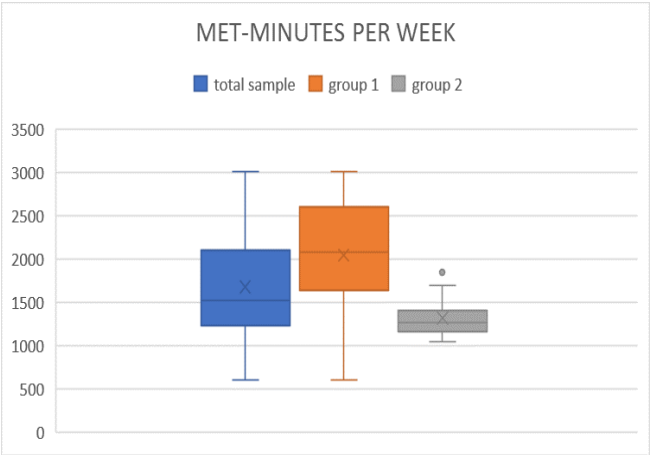

Figure 3: Met-min per week

Table 4 and figure 4 shows the comparison between group 1 and 2 in physical activity category, significant difference was found between group 1 and 2 in physical activity category as p value = 0.007.

Table 4: Physical activity category				
Group (n)	Moderate n (%)	High n (%)	Likelihood Ratio	P-value
Group 1 (30)	25 (83.3%)	5 (16.7%)	7.4	0.007
Group 2 (30)	30 (100.0%)	0 (0%)		

n number of cases, % percent within group.

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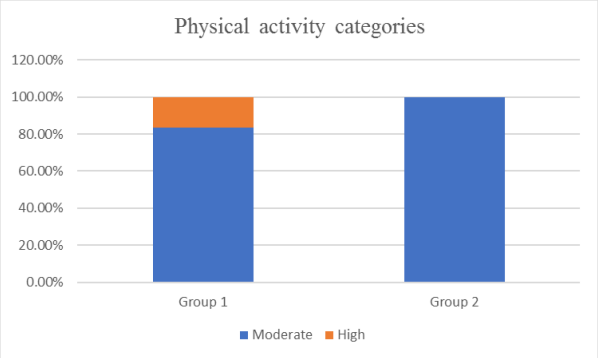

Figure 4: Physical activity category

Discussion

The current study conducted on 60 adolescents divided into two groups of group 1 included 30 normal adolescents and group 2 included 30 adolescents with history of rheumatic fever and they didn't complain from any complications related to rheumatic fever and they receive penicillin as a prophylactic treatment after the attack of rheumatic fever.

In this current study physical therapy activity level was assessed using IPAQ-SF this is supported by the previous investigation conducted by Kolbas et al and Nascimento-Ferreira MV, et al.[6,7] Finding of the current study showed that there were no statistical differences were found between the two groups in age, weight and height and statistical difference between both group 1 and group 2 in both MET-min. per week and physical activity category, which reflect higher activity level of the normal adolescents than those having history of rheumatic fever and receiving penicillin injection as prophylactic management of rheumatic fever.

Results of the current study supports the earlier finding of Feinstein et al. that adolescents with no history of rheumatic fever having higher level of activity than persons receiving penicillin secondary to attack of rheumatic fever.[10] The difference between the two groups can be related to overprotection from families of group 2 and the feeling of threats of being exposed to cardiac complication of rheumatic fever. The finding of the current study is matched with that of Feinstein who assessed the impact of physical restrictions on patients' psychosocial reactions and recommended careful consideration of activity restrictions for asymptomatic patient's post-rheumatic fever.[10]

The findings of Posadzki, Pawel, et al. underscore the significant impact of exercise on reducing mortality rates and enhancing quality of life, with particular emphasis on the benefits for patients with mental health conditions. The document also highlights the importance of methodological quality and evidence strength in evaluating the effectiveness of exercise interventions, providing valuable insights for future research, clinical practice, and public health initiatives.[15]

Implication on physical therapy practice:

Activity levels have an impact on physical therapy practice in multiple ways. Being physically fit is crucial for patients under physical therapy since it has been demonstrated that increased physical activity reduces the risk of injuries and improves performance.[16]

Physical therapists are essential in helping their patients become more physically fit and active since these activities have good health effects and aid in functional rehabilitation and adaption.[17] Ongoing physical therapy services are required in the acute care context in order to update home exercise regimens, give patients consistent access to exercise programs, and check for new complaints.[18]

A sedentary lifestyle can raise the risk of musculoskeletal illnesses or injuries related; they are some of main causes of referring cases to physical therapy.[19] Furthermore, physical therapists are well qualified to treat and prevent chronic diseases like diabetes by addressing lifestyle risk factors like inactivity. They can also offer therapeutic exercise programs.[20,21]

Adults at risk of noncommunicable diseases (NCDs) can increase their levels of physical activity (PA) in clinic-based settings by participating in physiotherapist-led physical activity (PLPA) programs, according to a meta-analysis by Breanne et al.[22] This current study examines the activity level of individuals with a history of rheumatic fever receiving penicillin injection and normal adolescents with no history of rheumatic fever finds that individuals with a history of rheumatic fever receiving penicillin injection had lower activity levels than normal adolescents with no history of rheumatic fever. Since activity level influences physical therapy practice. Adolescents with history of rheumatic fever and receiving penicillin injection are suggested to engage in exercise program in order to increase their activity level .

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Limitations:

The current study's limitations, including its restriction to teenagers who receive penicillin injections and do not have cardiac complications, only 60 adolescents were included in the number of cases, and we are unable to assess the adolescents' level of physical activity prior to the onset of rheumatic fever.

Conclusion:

Activity level in adolescents with history of rheumatic fever and receiving penicillin injection (group 2) was found to be lower than normal adolescents without history of rheumatic fever (group 1). As all subjects of group with history of rheumatic fever and receiving penicillin injection was selected without any cardiac complications and not suffering from any health problems so reduction in physical activity level in group 2 than group 1 can be related to over protection of those adolescent and restrictions in their function activity. Further research work recommended to investigate over protection on population with history of rheumatic fever and receiving penicillin injection.

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