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Original Article

Quality of Life and Physical Activity Level Among Children with Perthes Disease

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Abstract

Background: Legg-Calve-Perthes disease (LCPD) is a juvenile osteonecrosis of the femoral head, leading to hip pain, limping, and restricted range of motion in affected children. Physical activity restrictions are commonly advised to prevent femoral head deformity, but their impact on the quality of life in children with LCPD is not fully understood.

Methods: The case-control design was used to assess the physical activity levels and quality of life of 20 children with LCPD, comparing them to a control group of typically developing children via online questionnaires. The period of recruitment starts from July 2023 to November 2023. The Physical Activity Questionnaire for Children (PAQ-C) and the KIDSCREEN-10 questionnaire were used to collect data.

Results: Children with LCPD demonstrated significantly lower physical activity levels at school and during weekends at home compared to the control group. They also reported lower quality of life scores, with specific questionnaire items indicating reduced feelings of fitness, energy, and the ability to have fun with friends. Chronic pain, emotional impact, and physical activity restrictions were identified as contributing factors.

Conclusion: A holistic approach is needed to address the challenges faced by children with LCPD, encompassing effective pain management, identifying safe physical activities, and integrating psychological support into their care. This study highlights the importance of understanding the multifaceted impact of LCPD on affected children, emphasizing the need for further research and intervention to enhance their well-being.

Keywords: *Legg-Calve´-Perthes disease, quality of life, physical activity*

Introduction

Legg-Calve´-Perthes disease (LCPD) is a juvenile osteonecrosis of the femoral head, leading to hip pain, limping, and decreased ROM. However, Perthes disease affects a vast range of patients from 2 to 14 years old; patients older than 8 years of age at the onset of the disease may have a worse prognosis due to less remodelling potential of the deformed femoral head. Thus, operative and non-operative management is administered to reduce the femoral head deformity (1). Weightbearing and physical activity restrictions are commonly suggested for children with Perthes disease when the femoral heads are susceptible to deformation and loss of containment. These physical activity restrictions vary from abduction casting, using crutches and full weight-bearing with physical activity restrictions to reduce the load on affected hip (2–5). Few studies found that physical activity restriction may affect the quality of life among children with Perthes (6,7). Understanding the association between physical activity restrictions and the quality of life of patients with Perthes disease may help guide expectations and education for care providers, parents, and patients (8). Few studies have investigated the role of physical activity restrictions and quality of life in patients with Perthes disease, and most of these had a sample size of fewer than 2 0patients or focused on specific nations (6,7,9,10). Thus, this study aims to investigate the level of physical activity and quality of life among 20 children with Perthes disease from different countries to understand the effect of Perthes disease on those children.

Methods

Case-control study used online questionnaires survey. Two methods have been used to recruit case and control groups to complete the questionnaire survey. The case group (Perthes group) has been recruited through a Facebook page established for children with Perthes disease. The online survey was conducted to collect enough data as Perthes disease is considered rare. The control group has been recruited through friends and staff based on eligibility criteria via phone contact or WhatsApp application. The questionnaires explored physical activity levels and quality of life in children with Perthes. The data for physical activity level and quality of life were compared between children with Perthes and matched to typically developing children (control group). This study design is commonly used to compare patients who have a disease or outcome of interest ("cases") with a group who do not have the condition but are otherwise similar ("controls") (11).

Recruitment

Sample size

As Perthes disease considered as a rare disease (12), the convenience sample was considered to understand how the Perthes disease could affect children. The period of recruitment starts from July 2023 to November 2023.

Control subjects

20 Typically developing children were recruited as a "control group" via word of mouth and friends and relatives of staff whose children met the eligibility criteria **(Table 1)**. Interested parents contacted the researcher via phone number or WhatsApp application. The researcher checked the eligibility criteria for the control group before sending the information.

Table 1: Eligibility Criteria

	Control group	Perthes group
Inclusion criteria	- Aged between 6 and 12 years - Any gender - Free from any disease condition	- Aged between 6 and 12 years - Any gender - Perthes disease - Free from any pathologies (other than Perthes disease)
Exclusion criteria	- Previous surgery to lower extremities - Disorders leading to gait deviations	- History of fractures - Musculoskeletal injury of the lower limbs - Neurological pathologies

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Perthes subjects

20 children with the Perthes group were recruited through the Perthes group on the Facebook page. The researcher posted the advertisement on the Facebook page to encourage parents to participate in this research **(Table 1)**.

Physical activity and quality of life questionnaires

Information on physical activity level and quality of life might provide helpful knowledge about how children with Perthes feel and act compared to typically developing children.

The level of physical activity will be checked using the Physical Activity Questionnaire for Children (PAQ-C). This questionnaire was developed to evaluate general physical activity levels among children aged between 6 and 12. The PAQ-C requests answers for the last seven days, asking children to select the frequency of participation for a list of activities on the scale: "no", 1–2 times (in the week), 3–4 times, 5–6 times, and 7 times or more. In addition, there are questions about physical activity in physical exercise lessons, leisure time activities, activities at school, activities after school and "the last weekend". The aim is to evaluate habitual moderate to vigorous physical activity in child populations (13). The physical activity questionnaire (PAQ-C) has good reliability and validity value (14).

In addition, the KIDSCREEN-10 questionnaire was used in this study to evaluate the quality of life among children with Perthes disease. The KIDSCREEN questionnaire aims to identify children at risk because of health problems and can help determine the adverse effects of a particular disease or disability. Checking the health-related quality of life (HRQOL) of children can also assist in predicting hidden morbidity and healthcare requirements, which might not be identified using traditional medical regimes. Ravens-Sieberer et al. (15) found that the KIDSCREEN-10 questionnaire had a construct validity (r=0.43 to 0.63) and test t-retest reliability (ICC=0.70).

The KIDSCREEN-10 score contains 10 items. Each item is answered on a five-point response scale. The item statements are: (1) Have you felt fit and well? (2) Have you felt full of energy? (3) Have you felt sad? (4) Have you felt lonely? (5) Have you had enough time for yourself? (6) Have you been able to do the things that you want to do in your free time? (7) Have your parent(s) treated you fairly? (8) Have you had fun with your friends? (9) Have you got on well at school? and (10) Have you been able to pay attention? Answer options for items 1 and 9 are: "not at all", "slightly", "moderately", "very", and "extremely"; for all other items, the options are "never", "seldom", "quite often", "very often" and "always". Items 1 and 2 explore the child's level of physical activity, energy and fitness. Items 3 and 4 cover how much the child experiences depressive moods, emotions, and stressful feelings. Items 5 and 6 ask about the child's opportunities to structure and enjoy their social and leisure time and participation in social activities. Item 7 explores the quality of the interaction between the child and parent(s)/carer(s) and the child's feelings towards them. Item 8 examines the nature of the child's relationships with other children. Finally, items 9 and 10 explore the child's perception of their cognitive capacity and satisfaction with school performance. A low score indicates a poor HRQOL, and a high score indicates a better HRQOL.

Data analysis

Shapiro-Wilk (S-W) test was used to ensure whether the data was normally distributed or not. Significance for normality will be set at $p<0.05$, with all analyses below this value assumed to be normally distributed to support a parametric test. All statistical analyses were conducted using SPSS (version 27). The questionnaires (PAQ-C and KIDSCREEN) were evaluated between groups using the non-parametric Kruskal-Wallis test.

Result

The Number of participants who completed the questionnaire is 40, 20 control and 20 Perthes. The control group was 10 boys and 10 girls. Perthes group contains 13 boys and 7 girls, with only 4 children with surgeries as described in **Table 2**.

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Table 2: Population properties compared between control and Perthes groups

	Control Mean (±SD)	Perthes Mean (±SD)	P value
Number of Subjects	20 (boy:10, Girl:10)	20 (boy:13, Girl:7)	
Age (years)	8.18 (1.801)	8.20 (1.823)	0.965
Several children with Perthes have had surgery.		4	

Physical Activity Questionnaire (PAQ-C)

The PAQ-C measures the mode, frequency, and duration of physical and sedentary activities across all domains over the previous seven days. The mean and standard deviations (SD) of total hours for each domain were calculated for weekday and weekend days, and the results are presented in **(Table 3)**.

The PAQ-C showed no statistically significant difference between Perthes and control groups in sports activities, leisure time activities, and activities at school and home ($p>0.05$). The Perthes group spent less time in sports activities per weekday and weekend day compared to the controls, with a difference of approximately one hour. Time spent in leisure time activities was higher by approximately one hour in the Perthes group than controls during weekdays but higher by about half an hour in the control group on weekend days. The Perthes group spent half an hour less than the control group on activities at school and approximately four hours less on activities at home on weekdays and weekend days.

Table 3: Physical activity questionnaire (PAQ-C)

Domain		Control Mean (± SD)	Perthes Mean (± SD)	P Value
Sports activities	Hours/weekday	2.992 (2.709)	1.775 (2.029)	0.171
	Hours/weekend day	1.975 (1.863)	1.165 (1.397)	0.127
Leisure time activities	Hours/weekday	1.396 (1.451	3.617 (4.172)	0.281
	Hours/weekend day	2.183 (3.086)	1.692 (2.656)	0.272
Activities at school	Hours/weekday	0.948 (0.745)	0.321 (0.749)	0.001
Activities at home	Hours/weekday	13.915 (14.10)	11.242 (11.47)	0.645
	Hours/weekend day	11.751 (9.016)	5.683 (5.443)	0.030

*Key: **Bold** indicates significant value; P: Significant difference between control and Perthes groups.*

Health-related quality of life (KIDSCREEN-10) questionnaire

The KIDSCREEN-10 questionnaire measured health-related quality of life (HRQoL). It consists of ten questions, each answered on a five-point response scale. Responses were all reported as means and standard deviations (SD). Rasch scores and T-values were calculated according to the KIDSCREEN-10 manual. As most of the responses were not normally distributed, the Kruskal-Wallis test was used to compare normal (control group) KIDSCREEN-10 T-values with Perthes group T-values and differences between the groups for individual KIDSCREEN-10 questions **(Table 4)**.

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Table 4: Health-related quality of life (KIDSCREEN-10) questionnaire			
Questionnaire items	**Control Mean (± SD)**	**Perthes Mean (± SD)**	**p**
1. Have you felt fit and well?	4.550 (0.759)	3.700 (1.031)	0.005
2. Have you felt full of energy?	4.800 (0.523)	3.850 (1.089)	0.001
3. Have you felt sad?	3.600 (1.635)	3.000 (1.298)	0.179
4. Have you felt lonely?	3.450 (1.701)	3.400 (1.429)	0.757
5. Have you had enough time for yourself?	4.650 (0.587)	3.650 (1.348)	0.008
6. Have you been able to do the things that you want to do in your free time?	4.350 (1.137)	3.400 (1.273)	0.006
7.Have your parent(s) treated you fairly?	4.850 (0.366)	4.400 (0.821)	0.033
8. Have you had fun with your friends?	4.800 (0.523)	4.050 (1.146)	0.008
9. Have you got on well at school?	4.750 (0.550)	3.950 (0.999)	0.003
10. Have you been able to pay attention?	4.600 (0.821)	4.250 (0.967)	0.180
11. In general, how would you say your health is?	4.650 (0.671)	3.700 (0.979)	0.001
12. General HRQoL index (T-value)	61.187 (14.72)	46.723 (8.698)	0.001

*Key: **Bold** indicates significant value; SD: standard deviation; P: p-value for control compared to Perthes group; HRQoL: health-related quality of life.*

Table 3 compares the findings of the KIDSCREEN-10 questionnaire for control and children with Perthes. The T-value (general HRQoL index) was statistically significantly lower in the Perthes group than in the control group, indicating a lower quality of life score for children with Perthes ($p<0.05$). The detailed analysis demonstrated that the Perthes group are not felt fit and powerful, with a statistically significant difference compared to controls ($p<0.05$). However, psychological well-being was statistically significantly different between the Perthes and control groups, as the Perthes group felt sad ($p<0.05$). A statistically significant difference was revealed within the Perthes group with regard to "time for yourself" and the organisation of free time ($p<0.05$). Furthermore, the Perthes group scored statistically significantly lower on paying attention at school than the control group ($p<0.05$). They also scored statistically significantly lower for their general health than controls ($p<0.05$).

Discussion

This study result reveals that children with Perthes disease showed lower physical activity and quality of life scores compared with typically developing children in the same age group. The PAQ-C showed a statistically significant difference in activity at school and home on weekends. In addition, the T-value (general HRQoL index) was statistically significantly lower in the Perthes group than the control group, indicating a lower quality of life score for children with Perthes. The result of a lack of physical activity level and poor quality of life among children with Perthes may be due to pain,

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restriction of physical activity advice, and emotional impact.

Physical Activity Level and quality of life level

Children with Perthes disease in this study showed less PAQ-C and general quality of life score compared with typically developing children. These results align with Hailer et al.'s (16) study in lower quality of life, but the result of physical activity level is different. Hailer et al. (16) found that 54% of patients with Perthes disease had a high physical activity level compared with 39% in the Swedish reference Sample. The difference between the two studies may relate to population selection and the age of the Perthes group, who were 14 years and above. The possible causes that may contribute to a decrease in the physical activity level and poor quality of life are dimensions of mobility, pain, and anxiety/depression, as suggested by Hailer et al. (16). The dimension of mobility is related to restricting physical activity advice. Children with Perthes are asked to avoid activities involving huge peak impact load on the affected hip, such as trampolining, jumping and running (9). Although these activities are favourite exercises, which children love to do in their spare time, doctors advise stopping them. Meyerber et al. (17) and Hurson et al. (18) found that trampolining is a high-risk activity with the potential for significant orthopaedic fracture. In addition, differences in jumping are evident between overweight and normal-weight children, with less hip and knee flexion and a significant reduction in the hip moment and work in the former (19). Running has been found to increase the load on foot compared to walking in typically developing children aged between four and ten years (20). In addition, Ounpuu (21) reports that injuries associated with running might be due to increased stress mechanisms of the body, including increased velocity, joint ROM, forces, joint moment, joint power and muscle activities, compared to walking. Because all these activities increase the load on the joints, doctors advise children with Perthes to stop them. The consequences of this among children with Perthes are still unknown; further research in this area would be beneficial to understand how children with Perthes feel and help clinical professionals enhance their psychological well-being. Pain is another dimension that affects physical activity level and quality of life. The significant amount of pain may lead children with Perthes to feel anxious and participate less in physical activities, negatively impacting school in increased absence, lack of concentration, and poor sleep quality, as reported by Leo et al.(7). Pain management is not paid much attention in either physiotherapy sessions or the literature. The only method mentioned in the literature is painkillers, as reported by Leo et al.(7) and Nelitz et al. (22). In addition, Children with Perthes develop pain with physical activity, as reported by Nelitz et al. (22). Thus, children with Perthes tend to reduce physical activities to avoid pain, which leads to increased body weight, as presented in the Neal et al. (23) study. Children with Perthes disease showed emotional impact in this current study, as they showed significantly lower scores (than controls) on psychological well-being factors. Continisio et al. (24) suggest that chronic disease management, mainly in children, requires an integrated physical and psychological approach to both children with chronic disease and their parents. They found a significant amount of stress among parents of children with chronic disease, which was positively correlated to the disease degree of children. They recommend routine psychological support for children and their parents in disease management. The concerns of children with Perthes and their parents could be resolved by decreasing pain levels, finding safe physical activities and integrating psychological professionals into the management routine, which could positively alleviate the stress and anxiety of both children with Perthes and their parents.

This study does not investigate the regression analysis to explore the relation between the level of physical activity and quality of life due to the small number of participants. Further study is highly encouraged to recruit a higher number of children with Perthes and their families and conduct the regression analysis.

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Conclusion

Children with LCPD face significant challenges in maintaining their physical activity, particularly at school and during weekends at home, as compared to typically developing children. Additionally, the study highlighted a lower quality of life among these children, revealing feelings of reduced fitness, energy, and the ability to have fun with friends .To address these issues, a holistic approach is needed. This includes developing more effective pain management strategies, identifying safe physical activities suitable for children with LCPD, and integrating psychological support into their routine care. Further research and intervention in this area are essential to improve the overall quality of life and physical health of these children as they navigate the complexities of living with LCPD.

Disclosure

Conflict of interest

The authors declare that they have no conflicts of interest regarding the research, authorship, and publication of this paper.

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Ethical consideration

The ethical approval was obtained from the Research Ethics Committee in the College of Medical Rehabilitation Sciences at Taibah University (CMR-PT-2023-07)

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection, and final writing of the manuscript.

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