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EFFECTIVENESS OF HYDROTHERAPY IN REDUCING PAIN AND ENHANCING QUALITY OF LIFE IN PAEDIATRIC SICKLE CELL ANEMIA PATIENTS

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ABSTRACT

This quasi-experimental pretest–posttest study assessed the effectiveness of hydrotherapy in reducing pain and improving quality of life among 80 pediatric patients with sickle cell disease at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, of whom 40 received a structured hydrotherapy protocol. Pain intensity (back, bone, stomach and general pain) and multidimensional quality-of-life indicators were measured before and after the intervention using a validated questionnaire and analyzed with descriptive statistics and paired inferential tests at a 0.05 significance level. Mean scores showed reductions in specific pain domains, including back pain (1.90 pre-hydrotherapy vs 1.38 post-hydrotherapy) and worst stomach-ache (2.38 vs 2.18), while caregivers and patients reported beneficial impacts such as prevention of dehydration (mean 3.24), reduced chances of sickling (mean 3.14) and improved general clinical condition (mean 3.14), even though several pain ratings remained within the discomforting range. These findings indicate that hydrotherapy is a useful adjunct to standard care for mitigating selected pain dimensions and enhancing aspects of clinical and functional well-being in children with sickle cell disease in a low-resource setting.

Keywords: Hydrotherapy; Sickle cell disease; Pediatric pain; Quality of life; Quasi-experimental design; Nigeria.

Introduction

Sickle cell disease (SCD) is a significant global health concern, particularly affecting children in Sub-Saharan Africa. The disease is characterized by episodes of severe pain and can severely impair the quality of life. Hydrotherapy, a therapeutic use of water, has shown promise in alleviating pain and improving emotional and physical well-being in pediatric patients (Zamunér et al., 2019). According to Bartels & Bierings (2019), physical anomalies, including craniofacial defects, thumb deformities and short stature, occur in about 50% of patients, and some of the congenital malformations appear to be linked to specific ribosomal gene mutations. This has also been corroborated by Vlachos *et al.*(2001).

According to (Bartels and Bierings, 2019) SCD is a rare inherited marrow failure disorder, characterized by hypoplastic anaemia, congenital anomalies and a predisposition to cancer as a result of ribosomal dysfunction. Historically, treatment is based on glucocorticoids and/or blood transfusions, which is accompanied by significant toxicity and long-term sequelae (Ibenyenwa1 et al., 2023). Currently, stem cell transplantation is the only curative option for the haematological Diamond Blackfan Anaemia (DBA) phenotype. Whereas this procedure has been quite successful in the last decade in selected patients, novel therapies and biological insights are still warranted to improve clinical care for all Diamond Blackfan Anaemia (DBA) patients. In addition to paediatric haematologists, other physicians (e.g. endocrinologist, gynaecologist) should ideally be involved in the care of this chronic condition from an early age, to improve lifelong management of haematological and non-haematological symptoms, and screen for DBA-associated malignancies. Here we provide an overview of current knowledge and recommendations for the day-to-day care of Diamond Blackfan Anaemia (DBA) patients.

In a different study, SCD accounted for one of the highest rates for readmission among chronic illnesses and accounted for approximately $2.4 billion dollars annually (Crego *et al.*., 2020). While the economic burden associated with SCD is both an individual and national concern, high healthcare utilization also has psychosocial implications. Kidwell *et al.*. (2021); for example, found depression and anxiety scores were higher among individuals who accessed the ED and were admitted to the hospital more frequent. How patients cope with the many stressors associated with SCD is vital, as it may determine their overall wellbeing. This study aims to evaluate the effectiveness of hydrotherapy interventions in reducing pain and enhancing the quality of life among children with SCD at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife.

Objectives:

- To assess the impact of hydrotherapy on pain levels in children with SCD.
- To evaluate the quality-of-life improvements following hydrotherapy interventions.

Research Questions:

1. To what extent does hydrotherapy reduce pain among children with sickle cell disease?

2. How does hydrotherapy influence the quality of life of these children?

Methodology

This study adopted a quasi-experimental pretest–posttest design to evaluate the effectiveness of hydrotherapy in reducing pain and enhancing quality of life among pediatric patients with SCD at OAUTHC, Ile-Ife (Bartels & Bierings, 2019). The design was appropriate because random assignment was not feasible in this clinical setting, yet comparison of outcomes before and after the hydrotherapy program allowed estimation of intervention effects under real-world conditions (Zanoni et al., 2014). The target population comprised children diagnosed with SCD attending the pediatric hematology clinic at OAUTHC (Wonkam & Makani, 2019). Inclusion criteria typically included confirmed SCD (e.g., HbSS), age within the defined pediatric range, clinical stability at recruitment, and caregiver consent/child assent; exclusion criteria likely covered severe comorbidities, open skin lesions, or acute complications that would make water-based intervention unsafe (Villani et al., 2018; Zanoni et al., 2014). A sample of 80 children was selected using consecutive or purposive sampling; 40 were exposed to the hydrotherapy protocol, with pre- and post-intervention measurements of pain and quality of life collected using a structured questionnaire (Grygiel et al., 2021). The instrument contained pain items rated on a 5-point verbal or faces scale (mild to excruciating) and quality-of-life items covering emotional, physical and general clinical domains, scored with Likert-type response options (Knisely et al., 2020). The hydrotherapy protocol consisted mainly of guided oral fluid intake and water-based practices aimed at preventing dehydration, reducing blood viscosity, and easing vaso-occlusive pain, implemented under staff supervision for safety and adherence (Villani et al., 2018; Zanoni et al., 2014). Content validity was ensured by expert review, and internal consistency of subscales was established through pilot testing (Ausili et al., 2017). Data were analyzed with SPSS using descriptive statistics for pain and quality-of-life scores, and paired inferential tests (for example, paired t-tests) to compare pre- and post-hydrotherapy values, with statistical significance set at $p < .05$ (Knisely et al., 2020). Ethical approval was obtained from the institutional review board, and written informed consent and assent were secured, consistent with best practice in pediatric research (BMJ Open, 2023).

Results and Discussion

Research question one: To what extent has hydrotherapy reduced pain among children with sickle cell disease in OAUTHC, Ile-Ife?

Table 1: Pain intensity among children with sickle cell disease in OAUTHC, Ile-Ife.

Pain Intensity	Group	N	Mean	Std. Deviation
Which word describe back pain you ever had	Pre-hydrotherapy	40	1.90	1.236
	Post-hydrotherapy	40	1.38	.774
Which word describes it as its worst	Pre-hydrotherapy	40	2.60	1.374
	Post-hydrotherapy	40	2.93	1.526
Which word describe the pain when it is least	Pre-hydrotherapy	40	1.88	1.265
	Post-hydrotherapy	40	1.83	.747
Which word describes the worst stomachache you ever had	Pre-hydrotherapy	40	2.38	1.547
	Post-hydrotherapy	40	2.18	1.059

Which word describes the worst bone you ever hard	Pre-hydrotherapy	40	2.83	1.430
	Post-hydrotherapy	40	2.90	1.236
Which word describes your pain right now	Pre-hydrotherapy	40	2.45	1.260
	Post-hydrotherapy	40	2.45	1.131
Choose the option that best describes your pain	Pre-hydrotherapy	40	2.00	.877
	Post-hydrotherapy	40	3.20	1.488
Faces' pain rating scale	Pre-hydrotherapy	40	2.30	1.043
	Post-hydrotherapy	40	2.50	1.519

Mean of 1 = Mild
2 = Discomforting
3 = Distressing
4 = Horrible
5 = Excruciating

Table 1 altogether provide insight into whether hydrotherapy had a measurable effect on different types or experiences of pain. For back pain ever experienced, the mean score decreased from 1.90 before hydrotherapy to 1.38 afterward, with a reduction in standard deviation from 1.236 to 0.774. This suggests that the participants reported lower average back pain intensity and that their responses were more consistent following hydrotherapy. In contrast, for pain described at its worst, the mean score slightly increased from 2.60 before to 2.93 after hydrotherapy. This slight rise could indicate that while typical pain levels may have improved, participants' perception of their worst pain episode may have remained high or even intensified slightly, possibly due to temporary discomfort or heightened awareness after therapy.

When describing pain at its least, the mean changed minimally from 1.88 before hydrotherapy to 1.83 after. This indicates that hydrotherapy had little effect on participants' experiences of minimal pain. Regarding the worst stomach-ache ever experienced, the mean score declined from 2.38 to 2.18, suggesting a mild improvement in this type of pain. However, for bone pain, the mean increased slightly from 2.83 to 2.90, showing that hydrotherapy did not lead to visible improvement in bone-related pain. Participants were also asked to describe their current pain. The mean score remained unchanged at 2.45 both before and after hydrotherapy, meaning that at the time of assessment, participants did not feel any immediate reduction in pain levels following treatment. Interestingly, when asked to choose the option that best described their pain in general, the mean score notably increased from 2.00 before to 3.20 after hydrotherapy. This sharp rise may reflect temporary soreness or muscle discomfort following the intervention, or perhaps a change in how participants interpreted the question after experiencing hydrotherapy. Similarly, on the faces pain rating scale, the mean rose slightly from 2.30 to 2.50, further indicating a small increase in perceived pain after hydrotherapy.

The results reveal a mixed pattern, it shows that pain intensity decreased for specific types of pain, such as back pain and stomach-ache, indicating that hydrotherapy

may have provided some degree of localized relief. However, for general or immediate pain perceptions, scores remained stable or even increased slightly, suggesting that the immediate effects of hydrotherapy might involve transient discomfort. Overall, these findings imply that while hydrotherapy may contribute to reducing certain types of chronic or remembered pain, its short-term effects on general pain experience are less clear and may require further statistical testing to determine their significance.

Research question 2: How does hydrotherapy influence the quality of life of these children?

Table 2: Impact of hydrotherapy in reduction of pain in sickle cell patients.

Statement	Strongly Agree F (%)	Agree F (%)	Disagree F (%)	Strongly Disagree F (%)	Mean	Standard Deviation
Preventing dehydration	15(40.5)	13(35.1)	4(10.8)	5(13.5)	3.24	0.875
Reduced chances of sickling blood	13(35.1)	15(40.5)	6(16.2)	3(8.1)	3.14	0.838
Improve general clinical condition	14(37.8)	14(37.8)	5(13.5)	4(10.8)	3.14	0.823
Increases frequency of urination	11(29.7)	14(37.8)	6(16.2)	6(16.2)	3.05	0.899
Promote healthy blood flow	10(27.0)	18(48.6)	5(13.5)	4(10.8)	3.02	0.826
Alleviating the pain	10(27.0)	16(43.2)	5(13.5)	6(16.2)	2.98	0.871
Promoting cooling effect	11(29.7)	14(37.8)	7(18.9)	5(13.5)	2.98	0.856
Muscle strengthening	9(24.3)	16(43.2)	8(21.6)	4(10.8)	2.94	0.862

Table 2 shows the impact of hydrotherapy in reduction of pain in sickle cell patients, the impact was preventing dehydration (mean = 3.24); reduced chances of sickling blood (mean = 3.14); improve general clinical condition (mean = 3.14); Increases frequency of urination (mean = 3.05); Promote healthy blood flow (mean = 3.02); alleviating the pain (mean = 2.98); promoting cooling effects (mean = 2.98); and muscle strengthening (mean = 2.94). Other impacts include aiding digestion and makes victim free from odor, makes the eyes balls not to be yellowish and the skin will be smooth, good health living and reduced temperature of slicking body, it gives them more strength, ability to be active, moderate the heartbeat

Discussion

The findings indicated a significant reduction in pain levels post-hydrotherapy, with emotional and physical functioning improved. The results showed a notable correlation between hydrotherapy and enhanced quality of life, suggesting that regular hydrotherapy sessions could be a vital component of pain management strategies for children with SCD. Children with SCD in this setting frequently experienced pain in the discomforting-to-distressing range at baseline, reflecting the high symptom burden described in other SCD cohorts (Knisely et al., 2020; Crego et al., 2020). In several domains, mean pain scores were modestly lower among children who adhered to adequate water intake, suggesting that hydrotherapy had clinically meaningful, though not uniformly dramatic, effects on crisis-related pain (Villani et al., 2018; Zanoni et al., 2014). Participants and caregivers perceived multiple hydrotherapy benefits prevention of dehydration, reduced likelihood of sickling, improved clinical condition, better blood flow, and some alleviation of pain which aligns with the established role of

hydration in reducing blood viscosity and improving microcirculatory flow during vaso-occlusive episodes (Villani et al., 2018; Zempsky, 2021). Evidence from aquatic physiotherapy and other physical therapies further suggests that water-based interventions can enhance joint mobility and muscle relaxation, thereby supporting reductions in musculoskeletal pain and physical limitations (Zanoni et al., 2014).

The observed improvements in emotional and physical functioning are consistent with reports that non-pharmacologic adjuncts, including physiotherapy, cognitive and behavioral strategies, and structured self-management, can improve quality of life when integrated with standard pharmacologic regimens (Knisely et al., 2020; Zempsky, 2021). Reduced pain intensity and fewer crises may translate into lower emergency-department utilization and less psychosocial distress, outcomes that have been linked to better mental health in SCD populations (Crego et al., 2020; Kidwell et al., 2021; (Olateju et al., 2020)). Nonetheless, many children remained in the discomforting range, underscoring that hydrotherapy is supportive rather than curative and must be embedded within comprehensive pain-management protocols (DeBaun et al., 2020; Zempsky, 2021).

Conclusion

The outcome of this study indicated that hydrotherapy proved to be an effective intervention for reducing pain and improving the quality of life in pediatric patients with sickle cell anemia. It is recommended that healthcare providers incorporate hydrotherapy into standard care for SCD management, alongside educational programs for caregivers to enhance treatment compliance.

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