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EXPLORING THE ASSOCIATION OF SOCIODEMOGRAPHIC FACTORS WITH MUSCULOSKELETAL PAIN AMONG CHILDREN WITH SICKLE CELL DISEASE

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ABSTRACT: *Musculoskeletal pain is the most common manifestation among children with Sickle Cell Disease.* ***Objective:*** *This study aimed at evaluating the relationship between sociodemographic characteristics and musculoskeletal pain among children with sickle cell disease.* ***Methodology:*** *This was a cross-sectional analytical design.* ***Results:*** *Majority of participants were 9 years and above (55.1%) and females (55.7%). Most participants belonged to the upper class (64.8%), identified as Christians (80.7%), and resided in rural areas (75.6%). Descriptive analysis revealed that musculoskeletal pain was present in both mild and moderate forms. Inferential analysis showed no significant associations between sociodemographic characteristics (age groups, gender, class, religion, residence, parental marital status, parental socioeconomic status, number of family members and musculoskeletal pain severity among children with sickle cell disease ($p > 0.05$).* ***Conclusion:*** *Sociodemographic characteristics may not significantly influence musculoskeletal pain severity among children with sickle cell disease.*

KEYWORDS: Musculoskeletal pain, Sociodemographic, Sickle cell disease.

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INTRODUCTION

Musculoskeletal pain (MSK) is acute or chronic pain that affects bones, muscles, ligaments, tendons and nerves (El-Tallawy *et al*., 2021). It is a common clinical manifestation in children with SCD, presenting due to painful vaso-occlusive crises (Musowoya, 2019). It is a significant burden especially in Africa, with increased child morbidity and mortality (Oron *et al.*, 2020). It is the most common reason for hospitalization of children with SCD and contributes to the high cost of medical care (Fiocchi *et al.*, 2020). Socio-demographic characteristics, such as age, gender, and socioeconomic status, have been studied in relation to musculoskeletal pain in children with sickle cell disease (SCD) in developed and developing countries. Some studies have shown significant association while others have not. Results on different socio-demographic characteristics we have also been inconsistent. However, in Kenya, limited studies on musculoskeletal pain have been conducted and may be underestimated in children with sickle cell disease (Musowoya, 2019). A study conducted in Kilifi County showed that morbidity and mortality was high in young children with Sickle Cell Disease but was reduced with early diagnosis and supportive care (Uyoga *et al.*, 2019). This means that in case these children are not identified earlier through their sociodemographic characteristics or tests, the chances of living a long time are limited. Early diagnosis is important as it may enable early interventions. Complications on the musculoskeletal system cause the parts of the body not to get enough oxygen and to begin to die off slowly, resulting in permanent tissue damage and death (necrosis). Musculoskeletal pain can be acute or chronic and is unpredictable (Carroll, 2020).

A systematic review conducted on the prevalence, risks factors, prognosis and treatment of children with sickle cell disease presenting a painful crisis posed a burden to healthcare (Kamper *et al.*, 2016). Pain in children and adolescents was reported not well managed because health workers had little understanding of musculoskeletal pain conditions with little evidence to relate to clinical practice. This can contribute to inappropriate assessment and interventions of these children when in pain. Many children with sickle cell disease (SCD) experience recurrent and chronic musculoskeletal pain, which has a negative impact on their health-related quality of life (HRQL). In children, the most common pain experienced is musculoskeletal pain and this affects the normal growth and development of these children (Uwaezuoke *et al.*, 2018). Most of the children with musculoskeletal pain in sickle cell disease commonly use Opioids for treatment during painful episodes (Carroll, 2020).

LITERATURE REVIEW

This part presents literature from previous research on the relationship between socio-demographic characteristics and musculoskeletal pain among children with sickle cell disease). For instance, studies on the relationship between gender and musculoskeletal pain in children with SCD are inconsistent. Some studies have found that boys are more likely to experience musculoskeletal pain than girls while others have not found a significant difference between them. Other studies have found that older children and adolescents are more likely to experience musculoskeletal pain compared to younger children (Amusa *et al.*, 2021; Abrams, 2020; Adekile *et al*., 2019; Walker *et al.*, 2019). Socio-demographic factors such as socioeconomic status, culture and ethnicity, and access to healthcare have also been shown to influence musculoskeletal pain in children with SCD. .Research has also shown that children

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from lower socioeconomic backgrounds are more likely to experience musculoskeletal pain compared to those from higher socioeconomic backgrounds. This may be due to lack of access to healthcare and other resources that can help manage and prevent musculoskeletal pain (Musowoya *et al.*, 2019). Another study by Abrams (2020) also found the same results which states that children from lower socioeconomic backgrounds were more likely to experience musculoskeletal pain. This also concurs with a study by Adewoye *et al.* (2019) which found that children with SCD from low-income households have less access to healthcare and are more likely to experience musculoskeletal pain. A study by Anie *et al.* (2022) found that cultural and ethnic differences play a role in the expression and management of musculoskeletal pain among children with SCD and highlighted the need for culturally sensitive and tailored management approaches. A study was carried out to specifically assess the demographic characteristics of children with sickle cell disease, including age, gender among others. The results showed that male children with SCD had a higher prevalence than their female counterparts.

However, a study by Walker *et al.* (2020) reported that socio-demographic characteristics were not associated with musculoskeletal pain in children with SCD. When critically reviewing literature on this topic, it is important to consider the study design, sample size, and population being studied. The study had a small sample size, and therefore it could affect the generalizability of the findings. It is also important to consider the methods used to measure musculoskeletal pain, as well as the potential sources of bias and confounding in the study. For example, a study by Brown *et al.* (2020) used a self-reported questionnaire to measure musculoskeletal pain, which may not be as reliable as other methods such as clinical examination, and this could have affected the results. However, all these studies had small sample sizes, and more research is needed to confirm these findings. Despite the studies on the relationship between socio-demographic characteristics and musculoskeletal pain in children with SCD, there is still a lack of research in certain areas. For example, most studies have focused on adolescents, and there is a little research on musculoskeletal pain in younger children with SCD. There is also a need for more research to understand the specific mechanisms underlying the association between socio-demographic characteristics and musculoskeletal pain in children with SCD.

In summary, recent studies have found that older age, lower socioeconomic status and inconsistent relationship with gender have been associated with musculoskeletal pain in children with SCD. However, the findings are not consistent across studies and should be critically reviewed while considering the study design, sample size, and population being studied. Despite some studies, more research is needed in certain areas, such as the specific mechanisms underlying the association and understanding the musculoskeletal pain in younger children with SCD.

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METHODOLOGY

Research Design, Data Collection Tools and Analysis

This study employed a cross-sectional analytical study design to determine the relationship between socio-demographic characteristics and musculoskeletal pain among children with sickle cell disease, who had been attending the clinics for the last 6 months with a hemoglobin level of >6gm/dl two weeks prior. Children with other chronic conditions such as diabetes, hypertension, and heart conditions were excluded from the study. A total of 176 children aged 6-12 years with sickle cell disease were recruited from sickle cell and hemophilia clinics in four counties. The participants' sociodemographic characteristics, including age groups, gender, class, religion, residence, parents' marital status, parental socioeconomic status, and the number of family members, were collected. The severity of musculoskeletal pain was assessed using the Wong Baker Faces Pain Rating Scale. Wong Baker Faces Pain Rating Scale involves pictorial and self-reporting scales most recommended in children aged 4 years to 17 years (HockenBerry *et al.,* 2005). Descriptive statistics and inferential analyses, including chi-square tests, were conducted to examine the associations between socio-demographic characteristics and musculoskeletal pain severity. A stratified random sampling approach was employed. Both assent and consent were signed voluntarily. Socio-demographic information was collected using the International Physical Activity Questionnaire for the children (IPAQ-C). The pain was assessed and measured using Wong Baker Faces pain rating scale. To ensure the reliability of the questionnaires, the split-half method was employed, and Cronbach's coefficient alpha was computed. A reliability coefficient of 0.80 or above was considered satisfactory. Construct validity was established through careful questionnaire development based on existing knowledge and pre-testing to refine the measurement tools. Quantitative data were coded, entered into statistical software, and analyzed using descriptive and inferential statistics. The results were presented using frequencies, percentages, means, standard deviations, and inferential statistics. Chi-square test of independence was used to test association between the categorical variables. Permission to conduct the study was obtained from NACOSTI. Approval was obtained from the Institutional Ethical Review Committee of Masinde Muliro University of Science and Technology, county research and ethical review committees. Informed consent was obtained from the parents or guardians of the participating children. Privacy, confidentiality, and the well-being of the participants were ensured throughout the study.

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RESULTS

Descriptive Findings

Socio-demographic characteristics of the study sample, included age groups, gender, class, religion, residence, parents' status, marital status, parental socioeconomic status, and the number of family members. The total sample size was 176 participants. The majority of participants (55.1%) were 9 years and above, while 44.9% were 8 years and below. Females constituted 55.7% of the sample, while males constituted 44.3%. The largest proportion of participants (64.8%) belonged to the upper class, followed by the lower class (30.7%). A small percentage (4.5%) were not schooling. The majority of participants (80.7%) were identified as Christians, while 19.3% were Muslims. Most participants (75.6%) resided in rural areas, while 24.4% resided in urban areas. The most common parental status was both parents present (68.8%), followed by only the mother present (27.3%). A small percentage had none of the parents present (1.7%) or only the father present (2.3%). The majority of participants' parents were married (64.8%), while smaller proportions were single (23.3%), divorced (8.0%), or widowed (2.8%). Most participants (80.7%) had a moderate socioeconomic status, followed by those classified as poor (18.8%) and a small proportion classified as rich (0.6%). Approximately 57.4% of participants had five or more family members, while 42.6% had four or fewer family members.

Inferential Findings

The inferential findings include the chi-square test ($\chi 2$) and p-values, indicating the associations between sociodemographic characteristics and musculoskeletal pain severity. There was no statistically significant association between age groups and musculoskeletal pain severity ($\chi 2 = 0.044$, $p = 0.834$). No significant association was found between gender and musculoskeletal pain severity ($\chi 2 = 0.113$, $p = 0.736$). No significant association was found between religion and musculoskeletal pain severity ($\chi 2 = 0.125$, $p = 0.724$). There was no statistically significant association between residence (rural/urban) and musculoskeletal pain severity ($\chi 2 = 0.855$, $p = 0.355$). No significant association was found between parents' status and musculoskeletal pain severity ($\chi 2 = 2.234$, $p = 0.525$). There was no statistically significant association between marital status and musculoskeletal pain severity ($\chi 2 = 2.988$, $p = 0.560$). No significant association was found between parental socioeconomic status and musculoskeletal pain severity ($\chi 2 = 2.506$, $p = 0.286$). There was no statistically significant association between the number of family members and musculoskeletal pain severity ($\chi 2 = 0.272$, $p = 0.602$). Based on the findings, none of the socio-demographic characteristics examined in this study showed a significant association with musculoskeletal pain severity among children with sickle cell disease. These findings suggest that the severity of musculoskeletal pain may not be influenced by the age, gender, class, religion, residence, parents' status, marital status, parental socioeconomic status, or the number of family members of the participants.

Baseline Association between Socio-demographics and Self-reported MSK Pain among the Respondents in both Control and Experimental Groups

The results showed that 46 (26.1%) respondents reported mild MSK pain and 33 (18.8%) reported moderate MSK pain. The analysis of the relationship between MSK pain and age groups showed no statistically significant difference between the two age groups (p=0.834).

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There was also no statistically significant difference in MSK pain prevalence between males and females (p=0.736). Similarly, there was no significant difference in MSK pain between respondents of different classes, religions, or residences. Regarding parental socioeconomic status, the results showed no statistically significant difference between respondents with moderate or poor status (p=0.286). Furthermore, the number of family members was not found to be associated with MSK pain (p=0.602). In terms of marital status, divorced respondents reported slightly higher MSK pain prevalence than others, but this difference was not statistically significant (p=0.560).

In summary, the results suggested that socio-demographic characteristics may not be strong predictors of MSK pain prevalence among the general population of children with sickle cell disease.

Table 4.1 summarizes the baseline association between socio-demographics and self-reported MSK pain among all respondents in both control and experimental groups.

Table 4.1: Baseline association between socio-demographics and self-reported MSK pain among children with sickle cell disease

Characteristics		Group				p-value
		Control(n)		Intervention(n)		
		Mild	Moderate	Mild	Moderate	
Age groups (years)	8 years and below	13	13	46		0.834
	9 years and above	10	21	58		
Gender	Female	14	18	59		
	Male	9	16	45		0.736
Class	Lower	5	7	36		
	Upper	18	27	68	1	0.008
Religion	Christian	18	26	83		
	Muslim	5	8	21	0	0.724
Residence	Rural	18	24	76	15	
	Urban	5	10	28	0	0.355
Parents status	Both parents	16	25	71	9	
	Single parent	11	9	33	6	0.525
Parental marital status	Divorced	4	3	6	1	
	Married	14	25	68	7	0.560
	Single	5	6	28	7	
	Rich	19	32	88	4	

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Parental socioeconomic status	Poor	4	2	16	11	0.286
Family members	4 or less	8	6	46	15	0.062
	5 or more	15	28	58	0	

DISCUSSION

This study investigated the relationship between socio-demographic characteristics and musculoskeletal pain among children with sickle cell disease. The focus is on the results from the Chi square statistics that showed various results on the association between socio-demographic characteristics and musculoskeletal pain among children with sickle cell disease. In order to contextualize these findings, a review of relevant literature from studies conducted was done and compared with these studies results.

The results showed that none of the socio-demographic characteristics showed a significant association with musculoskeletal pain severity (all $p > 0.05$). This finding is significant because it counters some assumptions that socio-demographic factors such as age, gender, class, religion, and others have a notable impact on pain severity in patients with sickle cell disease. These results align with those of previous studies that have also failed to find a significant association between age and the severity of musculoskeletal pain (Ezenwa *et al*., 2016). It was found that 55.1% of our participants were nine years and above, and 44.9% were eight years and below; yet, this had no significant effect on the severity of musculoskeletal pain ($\chi2 = 0.044$, $p = 0.834$). Another study that was conducted at Webuye County hospital on factors associated with SCD severity among patients found no association between sociodemographic characteristics and painful attacks in SCD (Oduor, 2018). Similarly, the results of this study found no statistical association between socio-demographic characteristics and MSK pain among the general population of children with sickle cell disease. Some of the characteristics, which included age, gender, socioeconomic status of the family and number of family members among others, were found not to be predictors of MSK in children with sickle cell disease. Just as the results of the study mentioned above, MSK is a presentation that occurs as a result of the severity of Sickle Cell Disease. However, a study conducted by Carlton Dampier and Lamia Barakat (2013) of Oxford Academy on pain in sickle cell disease, contradicts with the findings of this study. The results reported that adolescents experienced more pain and frequently unlike other ages. The study recommended that behavioral strategies would be helpful as part of multidisciplinary pain management more so in adolescents to increase coping mechanisms. Also, future therapies are critical to reduce the burden of pain in children and adolescents with SCD. The differences in the results could be due to the study design that was used and the sample size used.

The gender of participants, with females representing 55.7% and males 44.3%, also did not reveal any significant association with the severity of musculoskeletal pain ($\chi2 = 0.113$, $p = 0.736$). This result is consistent with a study which also did not find gender to be a significant predictor of pain severity in children with sickle cell disease (Anile *et al*., 2010). This study also found that the economic class of the participants did not significantly influence the musculoskeletal pain severity ($\chi2 = 1.132$, $p = 0.568$). In contrast, a study conducted on severe pain profiles and associated sociodemographic and clinical characteristics in individuals with sickle cell disease found that there was a significant association between socioeconomic

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distress and increased musculoskeletal pain in population with sickle cell disease. The lower socio economic status, the higher the level of pain (Mitchel et al., 2022). However, this study found no such association. This could be associated with the sample size that was used and the research design. Similarly, no significant association was found between religion ($\chi2 = 0.125$, $p = 0.724$), residence ($\chi2 = 0.855$, $p = 0.355$), parents' status ($\chi2 = 2.234$, $p = 0.525$), marital status ($\chi2 = 2.988$, $p = 0.560$), parental socioeconomic status ($\chi2 = 2.506$, $p = 0.286$), or the number of family members ($\chi2 = 0.272$, $p = 0.602$) and the severity of musculoskeletal pain.

A systematic review was conducted and published in a Brazilian journal on physical therapy on musculoskeletal pain in children and adolescents. The results showed that physical and psychosocial factors were associated with MSK pain, but the strength and direction of these relationships was not clear. Therefore, recommendations for further studies on the same were done (Kamper *et al.,* 2016). This remains contrary to the findings of this study where no significant association was found between sociodemographic characteristics and musculoskeletal pain in children with sickle cell disease. A cross--sectional case control study conducted in Iceland on musculoskeletal pain and its effect on daily activity and behavior in Icelandic children and youths with juvenile idiopathic arthritis revealed that children with juvenile idiopathic arthritis had more pain with many painful attacks compared with peers in control group who were the healthy peers (SvanhildurH *et al.,* 2022). This could be an indication that painful attacks could be exacerbated in children with other medical conditions unlike those without any other medical condition. However, this study did not include children with other medical conditions.

A retrospective study was conducted on gender related differences in Sickle Cell Disease in a pediatric cohort and found that pain crises were more common in boys than in girls (Giulia *et al.,* 2019). This means that the study supports that gender is a determinant factor in pain crises among the pediatric population with sickle cell disease. The results contradict the findings of this study which found gender as an insignificant factor or predictor of musculoskeletal pain among children with Sickle Cell Disease. Other studies found out that children with sickle cell disease had a higher incidence of musculoskeletal pain compared to healthy controls, but did not investigate potential associations with sociodemographic characteristics. This discrepancy may be due to the different study populations and methods used. The study findings are consistent with this study in that we also observed a higher incidence of musculoskeletal pain in children with sickle cell disease, but the results indicate that the pain is not associated with sociodemographic factors. For example, this study had a larger sample size and a more diverse population. These findings underscore the complexity of musculoskeletal pain in children with sickle cell disease, suggesting that it may not be adequately explained by these socio-demographic characteristics alone. Other factors, such as genetic influences, disease-related factors, psychological factors, or a combination thereof, might play a more substantial role. Therefore, future research should thus extend beyond socio-demographic characteristics, to include these factors in the understanding of musculoskeletal pain in children with sickle cell disease.

In summary, this study determined the relationship between socio-demographic characteristics and musculoskeletal pain among children with sickle cell disease. The study sample consisted of 176 participants, and their socio-demographic characteristics were examined, including age groups, gender, class, religion, residence, parents' status, marital status, parental socioeconomic status, and the number of family members. The descriptive findings revealed the distribution of participants across these characteristics, while the inferential findings explored the

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associations between these characteristics and musculoskeletal pain severity. The results indicated that none of the examined socio-demographic characteristics showed a significant association with musculoskeletal pain severity among children with sickle cell disease. While socio-demographic characteristics form an integral part of the overall understanding of a patient's experience and health outcomes, they do not appear to be predictive of musculoskeletal pain severity among children with sickle cell disease.

Overall, this study's findings add to the growing body of literature on musculoskeletal pain in children with sickle cell disease by indicating that there is no statistically significant association between socio-demographic characteristics and musculoskeletal pain in this population. However, other studies have found associations between other factors. Therefore, more research is needed to understand the underlying causes of musculoskeletal pain in children with sickle cell disease.

CONCLUSION

Based on the findings, socio-demographic characteristics such as age groups, gender, class, religion, residence, parents' marital status, parental socioeconomic status, and the number of family members do not have a significant association with musculoskeletal pain among children with sickle cell disease. These findings suggest that socio-demographic factors may not directly determine the experience of musculoskeletal pain among children with sickle cell disease. Therefore, further research is needed to explore other factors and develop targeted interventions for effective management of musculoskeletal pain in children with sickle cell disease.

RECOMMENDATIONS

1. Develop individualized treatment plans for children with sickle cell disease, considering their unique socio-demographic characteristics and pain experiences.

2. Educate the health workers and community on the relationship between socio-demographic factors and musculoskeletal pain in children with sickle cell disease.

Future Research

Conduct more extensive and longitudinal research to explore the socio-demographic factors such as disease-related factors disease (severity, genotype) and psychosocial factors that may contribute to musculoskeletal pain in children with sickle cell disease.

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