

## Enuresis in children and adolescents with sickle cell anemia is more frequent and substantially different from the general population.

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### Abstract

**Background and Aim:** Sickle Cell Anaemia (SCA) is the most common rooted haemoglobinopathy it is an inherited condition, autosomal recessive haemoglobin disorder, the disease has spread in many countries, and some of the African countries like Sudan and Middle Eastern countries like Saudi Arabia. Enuresis is defined as a complete or near-complete micturition in the bed during sleep. However, until now, the prevalence of enuresis in Saudi Arabia is still not determined, and there are no sufficient studies to link between enuresis and SCA. Therefore, this study aims to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia at a tertiary centre in Jeddah, Saudi Arabia.

**Method:** A cross-sectional study was done in 2019. Our sample size was 100 children with SCA. Their ages were between 3 to 14 years old. After excluding, our final sample size involved 70 children with SCA. Data collected asked and filled the questionnaire the caregivers of children with SCA. We got our data from hospital medical records of subjects participating according to our study variables which were: age, sex, and nationality, days of hospitalisation for the past year, have a history of enuresis and sickle cell disease other complications.

**Result:** Our final sample for analysis included 70 patients aged between 3-14 years old. There were 33 (47.1%) males and 37 (52.9%) females. We found that 34 children (48.6%) had enuresis, and the male had enuresis more than female. There was no significant difference between the prevalence of enuresis neither gender nor ages group. The most prevalent age group that had enuresis were ages 9 to 11 years old.

**Conclusion:** The primary outcome of our study indicated that children with SCA had enuresis that was (48.6%). Also, we found that the prevalence of enuresis was significantly higher in male compared to female. The significant finding was the children of SCA with enuresis aged from 9-11 years old being the most prevalent aged. Our recommendation for upcoming studies needs to make study with a larger sample size with a control group for both genders in different age groups. You are using accurate and straightforward questions for your survey.

**Keywords:** Pediatrics, UTI, Microbiology, Culture, Sickle cell, Enuresis, Children, Nephropathy.

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### Introduction

Sickle Cell Anaemia (SCA) is the most common rooted hemoglobinopathy it is an inherited condition, autosomal recessive haemoglobin disorder, the disease has spread in many countries such as Italy, Greece, and central India, and some of the African countries like Sudan [1,2]. It results from the replacement of glutamate for valine at six amino acids of the beta-globin chain. The mutation outcome in haemoglobin S lead to accumulation in tissue hypoxia, dehydration and oxidative stress. The accumulation leads to early destruction of red blood cell and become sickling, and lead to the vast-occlusive episode, then drive to multi organs damage [3].

However, enuresis in SCA patient may impact 30% to 70% of children or adolescents with sickle cell illness; it is a common issue [4]. While enuresis is defined as a complete or near-complete micturition in the bed during sleep. The most common form of bedwetting is monosymptomatic nocturnal enuresis (MNE), meaning that no daytime symptoms are pointing to bladder dysfunction [5].

A prospective cross-sectional study conducted in 2019 that carried out over 14 days in April 2011 in Western Sudan. This study involved 107 patients between ages 7 to 15 years old, with SCA in a steady state to inspect the effect of sickle cell anaemia on the quality of life of school-age children affected by the disease due to these three components: psychological, social, and schooling. The results showed that 107 patients with SCA. They found that Sickle Cell Disease (SCD) has many social and psychological problems which need to be addressed. Enuresis, depressive symptoms, school absentees, and worsening in school performance was the common issues encountered [6].

Although one of the recent studies that were performed in Sub-Saharan Africa in 2018 A cohort study that involved 243 and stated that children with sickle cell anaemia had more recurrent and more severe enuresis which continued to late adolescence than age and sex-matched controls. These features show a subset of enuresis that is hard to treat in the general population. Young age and enuresis in a family member define a subgroup of children with SCA more likely to have Enuresis [7].

Another cross-sectional study carried out in Southeast Nigeria in 2017 that resulted in nocturnal enuresis in 70 children with SCA may not be linked to hyposthenuria, the prevalence of hyposthenuria was 4.5% and 8.3% respectively for enuretic and non-enuretic topics, 6.7% and 10.9% for enuretic and non-enuretic issues and 4.5% and 6.7% for enuretic problems and 6.7% for enuretic problems. There were no statistically significant variations. Therefore, the connection between the enuretic topics and controls regarding the period of urinary control, family size, socioeconomic class, and enuresis history of a sibling was not statistically significant [8].

In 2015, a cohort study was conducted to complete the popularity of the risk factors for nocturnal enuresis with school-aged children with SCA notice in a tertiary health facility in Enugu, South-east Nigeria. The study was supervised by the University Of Nigeria Teaching Hospital (UNTH), A total of 140 children were calculated 70 with SCA and 70 with haemoglobin AA genotype, The mean Age of the study and discipline with the same age range of 5 to 11 years. In closure, children with SCA have affection to grow nocturnal enuresis compared to their analogue with routine haemoglobin genotype [9].

However, until now, the prevalence of enuresis in Saudi Arabia is still not determined, and there are no sufficient studies to link between enuresis and SCA. Therefore, this study aims to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia at a tertiary centre in Jeddah, Saudi Arabia.

**Method**

This study aimed to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia at a single center, Jeddah, Saudi Arabia. A cross-sectional study was done. Our sample size 100 children with SCA. Between the ages of (3-14) years after excluding surveys with missing data, our final sample size involved 70 children with SCA. There were no exclusion criteria. Data collectors asked and filled the questionnaire the caregivers of children with SCA. Complete confidentiality of information obtained from the patients was achieved, and information was only used for the benefit of the study. Data collected from hospital medical records of subjects participating according to our study variables which were: age, sex, and nationality, days of hospitalisation for the past year, have a history of enuresis and sickle cell disease other complications. Data entry was performed using Microsoft Excel, Statistical Package for social sciences (SPSS) was used of statistical analysis.

**Result**

**Population characteristics**

This study aimed to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia at a single center, Jeddah, Saudi Arabia. The study involved 100 children with SCA, after excluding surveys with missing data, our final sample for analysis included 70 patients, aged between 3-14 years old. There were 33 (47.1%) males and 37 (52.9%) females, the mean and standard deviation respectively were 8.87 ± 3.383

**Table 1: Sex.**

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	37	52.9	52.9	52.9
Male	33	47.1	47.1	100
Total	70	100	100	

**Table 2: Age.**

	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Error	Std. Deviation Statistic
Age	70	3	14	8.87	0.404	3.383
Valid N (list wise)	70					

**Enuresis in children with sickle cell anaemia**

The patients had enuresis were 34(48.6%), and the patients without enuresis were 36(51.4%) (Table 3).

**Table 3: Enuresis.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	36	51.4	51.4	51.4
	Yes	34	48.6	48.6	100
	Total	70	100	100	

A Chi-square test was performed between enuresis and how many times the child wet himself weekly (wet per week), results showed that child wet himself once or twice per month was 12 (Table 4). There was a potent significance relation between the enuresis and wet per week (P-value=0.000).

**Table 4: Prevalence of enuresis by frequency of wets.**

		Count			Total
		Enuresis		p-value	
		No	Yes		
Wet nights per week		36	0	0.000	36
	four times/week	0	4		4
	Once or twice/month	0	12		12
	one times/week	0	6		6
	seven times/week	0	11		11
	two times/week	0	1		1
Total		36	34		70

Males with enuresis were 19 out of 33 males, while females with enuresis were 15 out of 37 females (Table 5). There was not a significant difference in the enuresis between male and female children of SCA (P-value=0.155) (Table 6).

**Table 5: Enuresis. Sex Crosstabulation.**

Count		Sex		Total
		Female	Male	
Enuresis	No	22	14	36
	Yes	15	19	34
Total		37	33	70

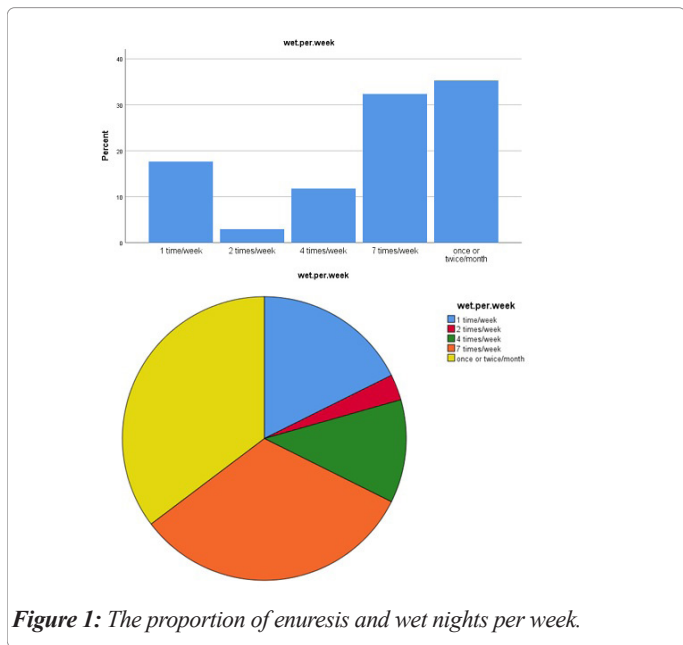


Figure 1: The proportion of enuresis and wet nights per week.

Table 6: Chi Square tests.

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.026 <sup>a</sup>	1	0.155		
Continuity Correction	1.402	1	0.236		
Likelihood Ratio	2.036 <sup>b</sup>	1	0.154		
Fisher's Exact Test				0.231	0.118
N of Valid Cases	70				

<sup>a</sup>0 cells (.0%) have expected count less than 5. The minimum expected count is 16.03.  
<sup>b</sup>Computed only for a 2 × 2 table.

The most prevalent age group that had enuresis was age group 3 (9 to 11 years old) (Table 7). In Table 8, showed there was not a significant difference in the enuresis with the age group (P-value=0.522).

Table 7: Age Group. Enuresis crosstabulation.

Count		Enuresis		Total
		No	Yes	
Age Groups:	3 to 5 years old	6	8	14
	6 to 8 years old	9	9	18
	9 to 11 years old	8	10	18
	12 to 14 years old	13	7	20
Total		36	34	70

Table 8: Chi Square tests.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.253a	3	0.522
Likelihood Ratio	2.28	3	0.516
N of Valid Cases	70		

<sup>a</sup>0 cells (.0%) have expected count less than 5. The minimum expected count is 6.80.

A most common complication of SCD with enuresis was acute chest syndrome/pneumonia was 11 (Table 9).

Table 9: Complications of SCD. Enuresis crosstabulation.

Count		Enuresis		Total
		No	Yes	
Complications of SCD		0	1	1
	Acute chest syndrome/pneumonia	10	11	21
	Avascular necrosis	3	1	4
	Leg ulcers	3	2	5
	None	20	17	37
	Stroke	0	2	2
Total		36	34	70

In Table 10, showed there was not a significant relationship between enuresis and complication of SCD (P-value=0.488).

Table 10: Chi Square tests.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.437 <sup>a</sup>	5	0.488
Likelihood Ratio	5.641	5	0.343
N of Valid Cases	70		

<sup>a</sup>8 cells (66.7%) have expected count less than 5. The minimum expected count is 0.49.

In Table 11, showed the number of parents who spoke to the doctors about enuresis were 32 (45.7%), and the number of parents who didn't talk to the doctors about enuresis was 38 (54.3%).

Table 11: Spoken to doctor about enuresis.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	38	54.3	54.3	54.3
	Yes	32	45.7	45.7	100
	Total	70	100	100	

In Table 12, showed the level of parents' concern about the enuresis was number 1 (30%) which means the parents not concerned about the enuresis, the fears of a patient parent about enuresis from 1 (didn't a concern ) to 10 (very matter).

Table 12: Concern of parents about enuresis.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	21	30	30	30
	2	13	18.6	18.6	48.6
	3	2	2.9	2.9	51.4
	4	9	12.9	12.9	64.3
	5	1	1.4	1.4	65.7
	6	5	7.1	7.1	72.9
	7	15	21.4	21.4	94.3
	8	4	5.7	5.7	100
	9	0	0	0	100
	10	0	0	0	100
Total		70	100	100	

The predictors of enuresis in children and adolescents with sickle cell anaemia are:

1. Family history and non-family history (Table 13), there was a potent significance relation.

**Table 13:** Family history versus non family history crosstabulation.

Count		No family history		Total
		Yes	No	
Family history	No	0	36	36
	Yes	34	0	34
Total		34	36	70

2. Diagnosis of SCD in infancy and determination at an older age (Table 14), there was a potent significance relation.

**Table 14:** Diagnosis of SCD infancy versus diagnosis at older age crosstabulation.

Count		Diagnosis at older age		Total
		No	Yes	
Diagnosis of SCD infancy	No	0	24	24
	Yes	46	0	46
Total		46	24	70

3. Hospitalisation past year and non-hospitalization patients (Tables 15 and 16), there was a potent significance relation. For summarisation out of 70 children with SCA, we found that 34 children (48.6%) had enuresis. There was a potent significance relation between the enuresis and wet per week, but no significant difference between the prevalence of enuresis neither gender nor ages group. The most prevalent age group that had enuresis were ages 9 to 11 years old.

**Table 15:** Hospitalization past year versus non hospitalization crosstabulation.

Count		Non hospitalisation		Total
		Yes	No	
Hospitalisation past year	No	0	33	33
	Yes	37	0	37
Total		37	33	70

**Table 16:** The independent predictor and their P value.

p-value	Independent Predictor
0.000	Family history versus non
0.000	Diagnosis of SCD in infancy versus diagnosis at older
0.000	Hospitalization past year versus non-hospitalization

## Discussion

This is a cross-sectional study to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia at a single, Jeddah, Saudi Arabia. The study involved 100 children, but only 70 children have filled the questionnaire, their ages between 3 to 14 years old.

Our result showed that males with enuresis were 19 (57.57%) out of 33, while females with enuresis were 15 out of 37 (40.54%) and there was not a significant difference in the enuresis between male and female children of SCA (P-value=0.155). Unlike the study done in Nigeria, they found a significant relationship between sex and enuresis (p=0.001) [9]. However, the prevalence of enuresis with age showed up the most popular age group between 9 to 11 years old (14.3%), but there was not a significant difference in the enuresis with the age group (P-value=0.522). Also, children with SCA and enuresis were 34 children (48.6%) out of 70 children had enuresis. Whereas a study was done in Turkey in 2007, the study involved 2000 children ages between 7 to 11 years, study result in the prevalence of nocturnal enuresis for females was 10.6%, for males it was 16.9%, and the overall incidence was 13.7%. The prevalence of nocturnal enuresis decreased with age [10].

Also, the most predictors in this study are family history, time of diagnosis, and admission of the patient. The p-value for them was 0.000. In the same study mentioned previously, the most predictor was significant family history (P=0.002), but the time of diagnosis (P=0.078), and enter the hospital (P=0.089) were non-significant that makes our result different and more uncertainty, and that is due to the small sample [7]. This finding is consistent with the study conducted in 2007; they found that nocturnal enuresis was the more common in children with a family history of bedwetting (76.5%) [10].

In this study was found that the severity and frequency of enuresis in children with SCA were slightly high due to the strong significance relation between the enuresis and wet per week (P-value=0.000), They found 49.4% of children had enuresis once per month, and 10.3% for every day. Similar to a study done in Sub-Saharan Africa in 2018 involved 243 children with SCA severity, and frequency of enuresis in children with SCA showed that (P-value=0.030) [7]. Compared to another study in Nigeria showed a significant relationship between enuresis and wet per week (P=0.001) [11].

In the United States city in 2012 show the result that sleep-disordered breathing was associated with enuresis. And it was significantly associated with an obstructive apnea-hypopnea index of 2 or more per hour after adjusting for age and gender Results of this study support that a pulmonologist should evaluate children with sickle cell anaemia who present with enuresis for sleep-disordered breathing [12]. In contrast, our study result that most of the children of sickle cell anaemia with enuresis they didn't suffer from any complication due to limited sample size in our study, but we found that 11 out of 34 patients have acute chest syndrome/pneumonia which is the most common complication of SCD according to our research.

In our study, the main limitations were small sample size, some patients aren't accurate in their answer, and we didn't have

a control group to see the prevalence of enuresis in children without SCA versus children with SCA. Also, we couldn't collect enough data to give accurate statistical analysis due to the short period.

### **Conclusion**

Our study aimed to determine the prevalence of enuresis in children and adolescents with sickle cell anaemia. The primary outcome of our study indicated that children with SCA had enuresis that was 48.6% substantially different from the general population. Also, we found that the prevalence of enuresis was significantly higher in male compared to female. The significant finding in our study was the children of SCA with enuresis aged from 9-11 years old being the most prevalent aged. While a prior study in separate towns, such as Sub-Saharan Africa in 2018, the most prevalent aged are 14-17, and they found a very high rate of enuresis in children with SCA 49.4% which persisted into late adolescence.

Our recommendation for upcoming studies needs to make study with large sample size and with a control group, for both genders with different age groups. You are using accurate and straightforward questions for your survey.

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