Factors Associated with Burkitt's Lymphoma in Children at Kisumu's Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu Kenya

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BACKGROUND

Burkitt's lymphoma is a highly aggressive lymphoma identified and described in the last century by Denis Burkitt in Africa having distinct characteristics and variants especially in areas endemic for malaria (Crombie & LaCasce, 2021; Ferry, 2006a). Burkitt lymphoma (BL) is an aggressive form of B cell lymphoma that can affect children and adults (López et al., 2022). Other than malaria, HIV has been suggested to have either a direct or indirect oncogenic role in Burkitt lymphoma (Atallah-Yunes et al., 2020)

Clinical outcomes of Burkitt's lymphoma are excellent in children and adolescents, but improvements are needed for adults with CNS involvement. Intensive supportive care is required at the first recognition of possible Burkitt's lymphoma in order to prevent early death from toxicity and organ compromise (Roschewski et al., 2022). In the World Health Organization (WHO) Classification, three clinical variants of Burkitt's lymphoma are described: endemic, sporadic, and immunodeficiency-associated types. Endemic Burkitt's lymphoma refers to those cases occurring in African children, usually 4–7 years old, with a male: female ratio of 2:1, involving the bones of the jaw and other facial bones, as well as kidneys, gastrointestinal tract, ovaries, breast, and other extranodal sites (Ferry, 2006b)

Intraabdominal extra nodal Burkitt lymphoma has a polymorphic presentation that includes bowel obstruction, intussusception, and appendicitis (Shaw et al., 2022). Early treatment is important and can demonstrate better prognosis. Prednisone, vincristine, cyclophosphamide, doxorubicin, and rituximab has demonstrated encouraging treatment outcomes (Connor., 2022).

Objective: To determine factors associated with Burkitt's lymphoma.

METHODS

Study design.

The study adopted a retrospective cross-sectional design. Patient records for Burkitt's Lymphoma were analyzed per study objective. Data extraction form was used to extract information relating to the study variables for 5-year period between 2019 and 2023.

Data analysis

The data collected was analyzed using SPSS version 29. Association between sociodemographic characteristics and Burkitt's lymphoma was done using chi-square test of association. The relationship between comorbidities and Burkitt's lymphoma was done using Pearson test of relationship. Kolmogorov test of normality was done to test normality of the data collected. A p value of <0.05 was considered statistically significant.

Ethical consideration

The study was authorized from Uzima University school of clinical medicine. The study got approval from Jaramogi Oginga Odinga Level six (6) ethical review committee as well as license to conduct study from National commission of science and Technology and Innovation (NACOSTI). Consent to collect data was obtained from the medical superintendent Jaramogi Oginga Odinga Teaching and Referral Hospital Kenya. All data collected were anonymized.

RESULTS

Age

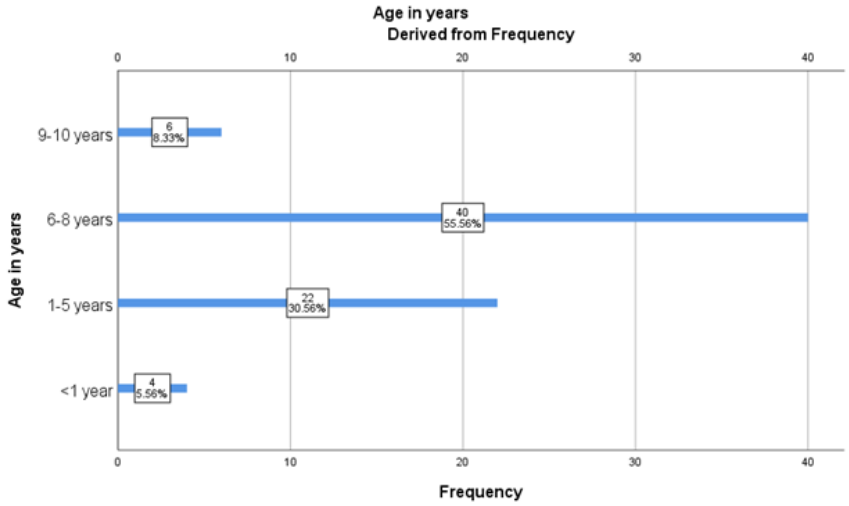

Figure 1: Age of children with Burkitts lymphoma

The current study found that majority (40, 55.56%) of the children diagnosed with Burkitt's lymphoma were aged 6-8 years, 22 (30.56%) aged between 1-5 years, 6 (8.33%) aged 9-10 years and 4 (5.56%) aged below 1 year. (Figure 1). The study sought to test hypothesis that there was no age variation of children with Burkitt's lymphoma at JOOTRH from the mean age at diagnosis of 6 years. One sample t test was used to test this hypothesis. The study found that there was statistically significant variation from the mean age of diagnosis (t-39.72, p=0.000, df=71, mean 2.67, std.dev 0.712). The finding could indicate that there is existence of variants of Burkitt's lymphoma which may have varied age at diagnosis.

Standard deviation/Z scores.

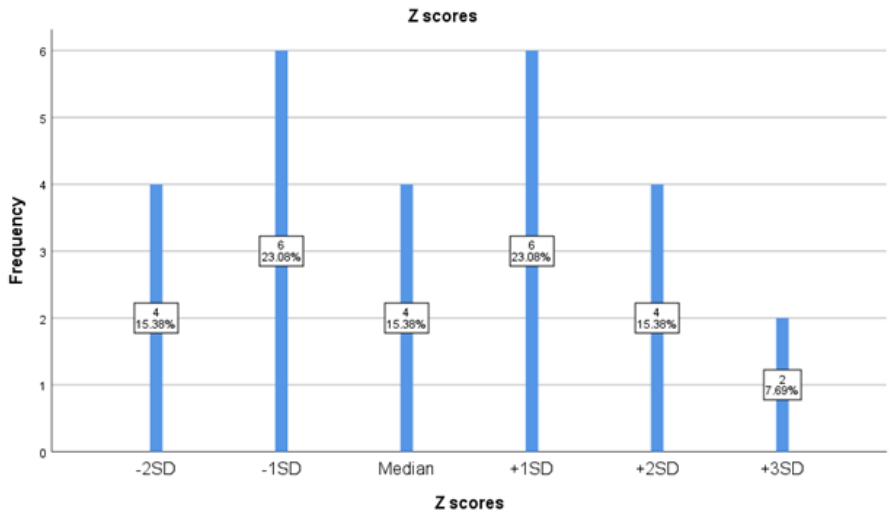

Figure 2: Z scores for children with BL

Regarding the Z scores, 26 (36.1%) of the respondents had Z scores documented in the patient records. Majority (6, 23.08%) had Z score of -1SD, another 6 (23.08%) had Z scores of +1SD, -2SD, Median and +2 SD each had 4 (15.38%). Minority (2, 7.69%) had Z scores of +3SD. (Figure 2). The study sought to test hypothesis that there is no variation in Z scores among children with Burkitt's lymphoma across different age groups. ANOVA was used to test this hypothesis. There is no statistically significant age variation of Z scores age wise for the children with Burkitt's lymphoma (p=0.372, F=1.033, df=25).

BMI

Table 1: Body Mass Index of Children with BL

Body Mass Index					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<18.5 kg/m2	20	27.8	43.5	43.5
	18.5-24.9kg/m2	15	20.8	32.6	76.1
	25-29.9kg/m2	5	6.9	10.9	87.0
	30.0-34.9kg/m2	4	5.6	8.7	95.7
	35.0-39.9kg/m2	2	2.8	4.3	100.0
	Total	46	63.9	100.0	

The study sought to establish the body mass index of children of Burkitt's lymphoma. Out of the 72 participants, there was no information captured in the patient records to help determine the BMI in (26, 36.1%) of children with BL. In the remaining population, majority (20, 43.5%) had a BMI less than 18.5, 15 (32.6%) had a BMI between 18.5 and 24.9, 5 (10.9%) had a BMI 25-29.9, 4(8.7%) had a BMI of 30-34.9 and minority (2, 4.3%) had a BMI of 35-39.9). (Table 1)

Table 2: Correlation of Sex, Family history of BL and use of insecticide

use of insecticide			Family History of BL		Total
			Yes	No	
Yes	Sex of child	Male	1	4	5
		Female	1	2	3
	Total		2	6	8
No	Sex of child	Male	1	36	37
		Female	2	25	27
	Total		3	61	64
Total	Sex of child	Male	2	40	42
		Female	3	27	30
	Total		5	67	72

Of those who used insecticide, majority of males (4, 50%) and females (2, 25%) did not have a positive history of Burkitt's lymphoma in the family. Only 1 (12.5%) of males and 1 (12.5%) had used insecticide and had a positive family history of Burkitt's lymphoma. (Table 2)

Table 3: Chi-square statistics for association of family history and BL

Test Statistics			
	use of insecticide	Family History of BL	Sex of child
Chi-Square	43.556[a]	53.389[a]	2.000[a]
df	1	1	1
Asymp. Sig.	.000	.000	.157

The study sought to establish if there is an association between use of insecticide, family history and sex of child with Burkitt's lymphoma. (Table 3). The study found that use of insecticide and positive family history of Burkitt's lymphoma had statistically significant association with Burkitt's lymphoma (P=0.000). Sex was not a determinant of Burkitt's lymphoma (p=0.157). the results of the current study could imply that use of insecticides and family history of Burkitt's lymphoma are important

The current study sought to establish the comorbidities among the children with Burkitt's lymphoma.

Table 4: Comorbidities in BL

Specific comorbidity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaria	20	27.8	62.5	62.5
	Sickle cell disease	12	16.7	37.5	100.0
	Total	32	44.4	100.0	
	No Comorbidity	40	55.6		
Total		**72**	**100.0**		

Majority of the children (40, 55.6%) did not have comorbidities. The remaining 32 (44.4%) had comorbidities. Malaria was the most present comorbidity (20, 27.8%) and sickle cell disease (12, 16.7%). (Table 4). The study sought to test hypothesis that comorbidities are not associated with Burkitt's lymphoma. There is no statistically significant association between commodities and Burkitt's lymphoma (p=0.157).

DISCUSSION

The current study found that 55.56% of children with Burkitt's lymphoma were males aged 6 – 8 years. Similar findings have been reported elsewhere (Harwood et al., 2021; Roschewski, 2022). This could mean perhaps that early screening particularly in male children aged 6- 8 years should be emphasized in sub-Saharan countries and developing countries like Kenya. The study found that there was statistically significant variation from the mean age of diagnosis (t-39.72, p=0.000, df=71, mean 2.67, std.dev 0.712). The finding could indicate that there is existence of variants of Burkitt's lymphoma which may have varied age at diagnosis. It should however be kept in mind that the current study did not delve into the location of lymphoma nor the type of diagnosis employed.

The study found that 23.08% of children had a Z score of -1SD which was the same proportion with those children with Z scores of +1 SD. Similarly, around 26% of children had a Body mass index less than 18. Z scores and BMI have traditionally been used to grade nutrition status in children and Z scores of -1 imply moderate malnutrition (Molyneux et al., 2017). The implication of this results in that nutritional status can significantly impact the treatment outcomes and perhaps health care providers should prioritize screening and intervening in case of children with suboptimal nutritional status to improve treatment outcomes among children with Burkitt's lymphoma. The study however found no statistically significant age variation of Z scores age wise for the children with Burkitt's lymphoma (p=0.372, F=1.033, df=25). Children will

malnutrition are more likely to abandon treatment for burkitts lymphoma compared to children without malnutrition (Pribnow et al., 2017).

The current study found that 50% of children with Burkitt's lymphoma had a positive history of insecticide use as well as a positive family history of burkitts lymphoma. Use of insecticide and positive family history of Burkitt's lymphoma had statistically significant association with Burkitt's lymphoma (P=0.000). Even though use of insecticide as used in insecticide treated treated nets has been associated with reduced Burkitt's lymphoma (Velavan & Kremsner, 2024), use of farm insecticide has been associated with Burkitt's lymphoma (Mavoungou et al., 2020). This therefore seem to suggest that health education intervention targeting pregnant women should be implemented to reduce the risk of childhood Burkitt's lymphoma. It should be kept in mind however that the current study did not delve into specific types of insecticide used.

CONCLUSION

Burkitt's lymphoma is a childhood neoplasia commonly affecting male children aged 6 and 8 years and Jaramogi Odinga Oginga level 6 Hospital. Use of insecticide and positive family history of Burkitt's lymphoma are important risk factors. Further studies need to be carried out on specific insecticides that predisposes to Burkitt's lymphoma among children in Western and Nyanza regions on Kenya.

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