Original Research Article

Journal of College of Medical Sciences-Nepal, Vol-20, No.4, Oct-Dec 2024

ISSN: 2091-0657 (Print); 2091-0673 (Online) Open Access

DOI: 10.3126/jcmsn.v20i4.72418

Prevalence of Nutritional Status and Treatment Outcomes among Children with Acute Lymphoblastic Leukemia (ALL) After Induction of Chemotherapy Phase IA

Niva Tiwari[1], **Krishna Sagar Sharma**[1], **Sudhir Adhikari**[1]

[1]Department of Medical Oncology, Pediatric Oncology Unit, B.P. Koirala Memorial Cancer Hospital, Bharatpur, Chitwan, Nepal.

ABSTRACT

Background

Acute Lymphoblastic Leukemia (ALL) survival rates in high-income countries is more than 80% but less than 30% in low and middle-income countries (LMICs). A myriad of factors including the presence of malnutrition is said to contribute to it. However, controversy about the effect of weight, BMI and nutritional status on survival and remission outcomes exist hence this study was conceptualized.

Methods

A retrospective cross sectional study was conducted in the department of Pediatric Oncology Unit, B.P. Koirala Memorial Cancer Hospital, Chitwan, Nepal. Patients with ALL diagnosis falling in normal weight or underweight category were included based under Z-score. Data was analyzed using descriptive and inferential Statistical tools usign SPSS. Study was conducted after taking ethical approval from IRC of BPKMCH.

Results

Among eighty two participants, majority of the children were less than 5 years age group, 91.5% were underweight (with 95% CI as 80.84% to 96.71%). There were four deaths and one refused treatment, four patients relapse and 59 had remission in underweight group. The statistically significant variable associated with nutritional staus as age.

Conclusions

The prevalence of underweight among ALL patients was high and in remission group they were relatively better nourished than other.

Keywords: acute lymphoblastic leukemia; nutritional status; malnutrition.

INTRODUCTION

Nepalese have lower relative survival (less than 30%) compared to high income countries (more than 80%).[1,2] Children with ALL have better survival than AML, but this advantage is small among Nepalese residents.[1,2] Malnutrition is one of the major problems in children and children suffering with cancer are at risk for malnutrition and complications.[3] Earlier studies have focused on anthropometric data including height, weight and BMI in an standard method of Z-score but failed to draw definitive conclusion.[4-12] Severe weight loss and abnormally low concentration of certain plasma proteins such as albumin and transferrin have been recognized for a long time in patients with cancer including children.[10] The aim of this study was to determine the nutritional status of children at diagnosis of ALL and their evolution during the initial first month of intensive treatment.

METHODS

A retrospective cross sectional study was conducted in the department of Pediatric Oncology Unit, B.P. Koirala Memorial Cancer Hospital, Chitwan, Nepal. The study which aimed to determine the relationship of

Correspondence: Dr. Niva Tiwari, Department of Medical Oncology, Pediatric Oncology Unit, B.P. Koirala Memorial Cancer Hospital, Chitwan, Nepal. Email: neevat@gmail.com, Phone: +977-9845052240. **Article received**: 2024-08-14. **Article accepted**: 2024-12-04. **Article published**: 2024-12-31.

nutritional status measured by Z-score [13] on treatment outcomes in terms of remission and relapse after induction phase 1A of chemotherapy for children with ALL. Non probablity sampling technique was used for data collection. The data for the study were collected from all pediatric ALL patients who were under treatement in BPKMCH from 2015 to 2020. All patients with ALL were included in this study. Lost to follow up and absence of repeat BMA were classified as poor outcomes in both groups. At baseline, the age, sex, BMA result, diagnosis, area of residence, height (in cms.) and weight (in kgs.) and BMI were collected. Both Standard Risk and High Risk ALL patients were included in the study. Standard Risk here meaning those patient who belongs to 1-10 years of age, whose total white cell count are less than 50,000, who has good response to prednisone and has no mediastinal mass in chest X-ray. Similarly, High Risk includes those patients who have one or all of these criteria which includes total white cell count of more than 50,000, patients who are below 1 year of age or more than 10 years, who shows no response to oral prednisone and/or there is presence of mediastinal mass in chest X-ray. Induction Phase chemotherapy was administered as per MCP-841 ALL protocol.[13]

Data was extracted from the Hospital registry database and entered into the Microsoft excel worksheet. Data was analyzed using descriptive and inferential Statistical tools usign SPSS-20. Data were analyzed by using descriptive and inferential Statistical tools. In the descriptive Statistics for categorical variable frequency and percentage were used while for continuous variable mean and standard deviation were used while to find the association between nutritional status with selected variables Chi-square test were used. p-value<0.05 was considerd as statitically significant.

RESULTS

In age, majority of the children were less than 5 years age group while 31.7% in 5-10 years age group followed by 28% in 10-15 years and least in 15-18 years. The mean and standard deviation of age of children was8.67±2.69 years. In sex, 74.4% children were male while 25.6% were female. In pre-tt BMA group 57.3% were ALL, HR and 42.7% were ALL, SR. Likewise in Post tt, BMA 4.9% children were expired, 1.2% were refuse treatment, 4.9% were relapse and 89% remission (Table 1).

Table 1. Clinico sociodemographic characteristics of children. (n=82)

Variables	Frequency (%)
Age	
<5	27(32.9)
10-May	26(31.7)
15-Oct	23(28.0)
15-18	6(7.3)
Mean±SD	8.67±2.69 years
Sex	
Female	21(25.6)
Male	61(74.4)
Pre-tt BMA	
ALL,HR	47(57.3)
ALL,SR	35(42.7)
Post tt BMA	
Expired	4(4.9)
Refused treatment	1(1.2)
Relapse	4(4.9)
Remission	73(89.0)

The prevalence of under weight among ALL patients was 91.5% (with 95% CI as 80.84% to 96.71%) (Table 2) (Figure 1).

Table 2. Nutritional status of children. (n=82)

Nutritional Status	Frequency (%)	95% CI	
		Lower	Upper
Normal	7 (8.5%)		
Underweight	75 (91.5%)	80.84	96.71

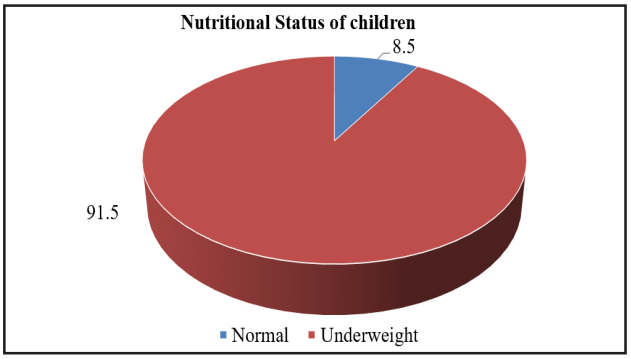

Figure 1. Nutritional status of children.

The association between nutritional status and Clinico sociodemographic variables of children is presented in the followwing table. This showed that majority of the children in the age group <15 years were underweight and there is statistically significant association between nutritional status of children and age (p-value<0.05). However all seven children with normal nutritional status were in remission at one month compared with 66(88%) out of 75underweight children. In sex, majority of male were underweight but there is no significant association between sex and nutritional status of child (p-value>0.05). Also, there is no statistically significant association between pre-tt BMA, post-tt BMA with nutritional status of children (p-value>0.05) (Table 3).

Table 3. Association between nutritional status and Clinico sociodemographic variables of children. (n=82)

Variables	Nutritional Status		Chi-square	p-value
	Normal	Underweight		
Age (years)				
<5	2(7.4)	25(92.6)	15.68	0.001
5-10	-	26(100)		
10-15	2(8.7)	21(91.3)		
15-18	3(50)	3(50)		
Sex				
Female	3(14.3)	18(85.7)	1.19	0.27
Male	4(6.6)	57(93.4)		
Pre-tt BMA				
ALL,HR	6(12.8)	41(87.2)	2.52	0.112
ALL,SR	1(2.9)	34(97.1)		
Post tt BMA				
Expired	-	4(100)	0.944	0.815
Refused treatment	-	1(100)		
Relapse	-	4(100)		
Remission	7(9.6)	66(90.4)		

DISCUSSION

Acute Lymphoblastic Leukemia (ALL) is the most common malignancy diagnosed in children, representing nearly 1/3rd of all pediatric cancers.[1] Cure is a realistic goal, as majority of children have continuous disease-free survival of 5 years and appear cred. Survival rate has improved significantly in most countries largely due to improvements in therapy.[2] In Nepal, survival rate has also improved. However, it is still lower compared with the Asian-Americas and Caucasians. Because of this, efforts to improve the survival of ALL children are in place. Search for the factors that contribute to this lower survival rate are continuous. One of the things being looked into is the nutritional status of children with ALL, whether under-nutrition is a risk factors to have poor outcome after chemotherapy. This study concludes that nutritional status based on the Z-score did not influence survival of relapse outcomes. Although the authors acknowledge that sample size and short duration of follow up in this study is a limitation. The finding in this study is contrary to the study of Mejia-Arangure,et.al[9] and Hafiz and Mannan.[5] The former study found that early mortality in undernourished children with ALL was higher than in normally nourished children. The latter authors said that malnourished children with ALL are prone to infection, required longer duration of Induction and prolonged hospital stay. Hijiya,etl.al[6] on the other hand concluded that BMI among patients with ALL does not affect the outcome or toxicity of chemotherapy. There were more males, more patients from outside Chitwan and more male children are undernourished. Age, weight, height, BMI and BMA results were similar in both groups at the outset. There were more under-nourished children than nourished children in the included participants. Nutritional status did not influence survival or relapse outcomes based on the limited samples studied.

CONCLUSIONS

The prevalence of underweight among ALL patients was high and in remission group they were relatively better nourished than other. The statistically significant variable associated with nutritional staus as age.

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to Mr. Hari Prasad Upadhyay, Assistant Professor of

Statistics in the Department of Statistics at Birendra Multiple Campus (TU), for helping me in data anlysis.

Conflict of interest: None

Funding: None

REFERENCES

1. American Cancer Society. (2013) Cancer Facts & Figures 2013. Atlanta, Ga: American Cancer Society. [Link]
2. World Health Organization. (2021). CureAll framework: WHO global initiative for childhood cancer: increasing access, advancing quality, saving lives. World Health Organization. [Link]
3. De Onis, M., C. Monteiro, J. Akre and G. Clugston. (1993) The worldwide magnitude of protein-energy malnutrition: An overview from the WHO global database on child growth. Bull. WHO., 71: 703-712. [PubMed]
4. Gelelete, C. B., Pereira, S. H., Azevedo, A. M., Thiago, L. S., Mundim, M., Land, M. G., & Costa, E. S. (2011). Overweight as a prognostic factor in children with acute lymphoblastic leukemia. Obesity (Silver Spring, Md.), 19(9), 1908–1911. [DOI] [PubMed]
5. Hafiz, MG and Mannan, MA. (2008) "Nutritional status at initial presentation in childhood acute lymphoblastic leukemia and its effect on induction of remission". MMJ 17(2 Suppl):S46-51. [PubMed]
6. Hijiya, N., Panetta, J. C., Zhou, Y., Kyzer, E. P., Howard, S. C., Jeha, S., Razzouk, B. I., Ribeiro, R. C., Rubnitz, J. E., Hudson, M. M., Sandlund, J. T., Pui, C. H., & Relling, M. V. (2006). Body mass index does not influence pharmacokinetics or outcome of treatment in children with acute lymphoblastic leukemia. Blood, 108(13), 3997–4002. [Link] [DOI]
7. Khan, AR; Sheikh, M and Intekhab, K. (2006) Pre-existing malnutrition and treatment outcome in children with acute Lymphoblastic Leukaemia. JPMA 56 (4):171-173. PMID16711338. [PubMed]
8. Khan AR, Sheikh MH, Intekhab K. Does weight for age have prognostic significance in children with Acute Lymphoblastic Leukemia? Pak J Med Sci. 22(2):167-170. [Link]
9. Mejía-Aranguré, J. M., Fajardo-Gutiérrez, A., Reyes-Ruíz, N. I., Bernáldez-Ríos, R., Mejía-Domínguez, A. M., Navarrete-Navarro, S., & Martínez-García, M. C. (1999). Malnutrition in childhood lymphoblastic leukemia: a predictor of early mortality during the induction-to-remission phase of the treatment. Archives of medical research, 30(2), 150–153. [DOI]
10. Redaniel, M. T., Laudico, A., Mirasol-Lumague, M. R., Alcasabas, A. P., Pulte, D., & Brenner, H. (2010). Geographic and ethnic differences in childhood leukaemia and lymphoma survival: comparisons of Philippine residents, Asian Americans and Caucasians in the United States. British journal of cancer, 103(1), 149–154. [DOI]
11. Schoeman, J., Dannhauser, A., & Kruger, M. (2010). Malnutrition in paediatric oncology patients. Continuing Medical Education, 28, 385. [Link]
12. Stolley, M. R., Restrepo, J., & Sharp, L. K. (2010). Diet and physical activity in childhood cancer survivors: a review of the literature. Annals of behavioral medicine: a publication of the Society of Behavioral Medicine, 39(3), 232–249. [DOI]
13. Wang Y, Chen HJ. Use of Percentiles and Z -Scores in Anthropometry. In Handbook of Anthropometry: Physical Measures of Human Form in Health and Disease. Springer New York. 2012. p. 29-48. [Link] [DOI]
14. Advani S, Pai S, Venzon D, Adde M, Kurkure PK, Nair CN,et al.(1999) Acute lymphoblastic leukemia in India: an analysis of prognostic factors using a single treatment regimen. Ann Oncol. 1999;10(2):167-76. [Link]

Citation: Tiwari N, Sharma KS, Adhikari S. Prevalence of Nutritional Status and Treatment Outcomes among Children with Acute Lymphoblastic Leukemia (ALL) After Induction of chemotherapy Phase IA. JCMS Nepal. 2024; 20(4): 328-031.