

## Original Article

### Treatment cost of Lymphoma in children in a Tertiary care hospital in Bangladesh

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#### Abstract

**Background:** Lymphoma is the third most common cancer in children. Hodgkin's disease has the highest cure rate in childhood malignancies. Counseling regarding the cost of treatment to the parents is one of the most important parts of the treatment. But as there is no published article or data available in our country regarding the actual treatment cost of the disease, it becomes very difficult for the Paediatric Haematologists and Paediatricians to give the exact idea to the parents about the treatment cost. **Objective:** The study aimed to ascertain the treatment cost of Hodgkin disease (HD) and Non-Hodgkin lymphoma (NHL), which would be a guideline about the treatment cost of Lymphoma to the healthcare provider and parents. **Methodology:** It was a cross-sectional observational study done in the Paediatric Hematology and Oncology Department of Bangladesh Medical University (former BSMMU) during May 2010 – September 2010. Treatment cost was assessed by analyzing 20 patients who were diagnosed case of Lymphoma. Among them, 6 patients were diagnosed case of H.D. and 14 were diagnosed case of NHL. **Result:** The approximate direct treatment cost has been found for Non-Hodgkin Lymphoma in FAB/ LMB 96 protocol (The FAB/LMB 96 protocol is a chemotherapy regimen used internationally for treating pediatric B-cell non-Hodgkin lymphoma (NHL), including Burkitt lymphoma) BDT 180,000 over 8 months and in the BFM-NHL 90 protocol (The BFM-NHL 90 protocol is a chemotherapy regimen developed by the Berlin-Frankfurt-Münster (BFM) group for treating non-Hodgkin's lymphoma (NHL) in children and adolescents.) BDT 298,000 over 26 months. While the treatment cost of Hodgkin disease has been found in Hybrid protocol BDT 102,000 over 6 months and in the ABVD protocol (ABVD is a chemotherapy regimen used in the first-line treatment of Hodgkin lymphoma where Adriamycin, Bleomycin, Vinblastine and Dacarbazine are used) BDT 48,500 over 6 months. In case of complications like Septicemia, additional treatment cost comes around BDT 28,258 for each episode of complication. **Conclusion:** The treatment cost appeared burdensome for low-income people of Bangladesh. The main cost for the treatment of Lymphoma is for Chemotherapy and Investigation. Studies abroad showed similar observations. So, to reduce the burden of cost, Unnecessary investigations should be avoided and policymakers should emphasize reducing the cost of Chemotherapy in Bangladesh.

**Keywords:** Treatment cost, Lymphoma, Tertiary care hospital.

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#### Introduction:

Lymphoma is the third most common cancer with serious health consequences. It includes more than 20 lympho-proliferative diseases classified into two main groups, Non-Hodgkin lymphoma (NHL) and Hodgkin disease (HD). In children aged 0-14, it is the third most common cancer. Hodgkin Disease has the highest cure rate in childhood malignancy. Over the last 30 years, the prognosis of HD has improved impressively with the use of combination chemotherapy with or without low-dose involved field radiation therapy. However, little information is currently available on the effective use of hospital resources and the resulting costs of treating any

childhood cancer.<sup>1</sup>

The combination chemotherapy regimens in current use are based on COPP (cyclophosphamide, vincristine [oncovin], Procarbazine and Prednisolone) or ABVD (Doxorubicin [adriamycin], bleomycin, vinblastine, and dacarbazine). Different combination regimens that reduce potential toxicities have been developed. Originally, a minimum of six cycles of chemotherapy was given with significant cumulative toxicity, including second malignancy, sterility and cardiac and pulmonary dysfunction. 'Risk adaptive' protocols are based on

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staging criteria as well as rapidity of response to initial chemotherapy. The aim is to reduce total drug dose and treatment duration and even eliminate radiation therap.<sup>2</sup>

Treatment is determined largely by disease stage, age at diagnosis, presence or absence of B symptoms, and the presence of hilar lymphadenopathy or bulky nodal disease. Using the current therapeutic regimen, patients with favorable prognostic factors and early-stage disease have an event-free survival (EFS) of 85-90%, and an overall survival of 5 years of 95%. Patient at advanced stage, disease has an EFS and OS of 80-85% and 90% respectively.<sup>2</sup>

The major factors driving the costs are as follows: stage radiological imaging, radiotherapy, second-line chemotherapy, hospitalization and febrile neutropenia. The total cost of treatment of HD is affordable for the developed countries, but it remains expensive for developing countries, like Bangladesh, where the per capita income is USD 780 in 2010. Early diagnosis, use of less toxic protocols such as ABVD, close monitoring to prevent complications and elimination of unnecessary tests and investigations may reduce the overall costs.<sup>3</sup>

## Objective:

To ascertain the treatment cost of H.D. and NHL and thereby to give a guideline about the treatment cost of Lymphoma to the Health Care Provider and Parents.

## Methodology:

This Cross-sectional, observational study was carried out from May 2010 to September 2010 in the Paediatric Haematology and Oncology Department of Bangladesh Medical University (former BSMMU). A total of 20 diagnosed cases of Lymphoma were selected. Among them

6 cases were Hodgkin disease (HD) and 14 cases were diagnosed as Non-Hodgkin Lymphoma (NHL). All the patients were between 5-15 years of age. Patients with malignancies other than Hodgkin disease and non-Hodgkin lymphoma are excluded from this study.

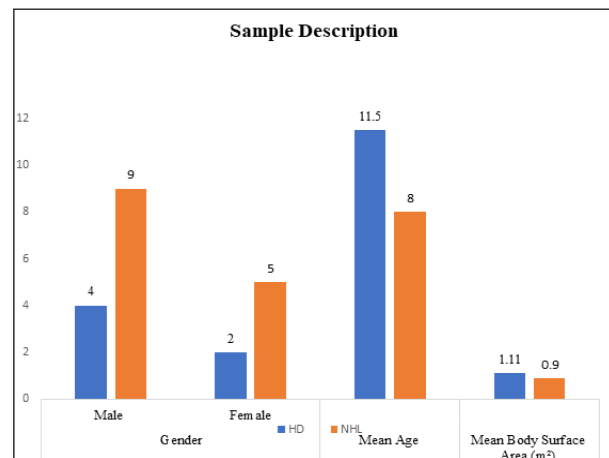
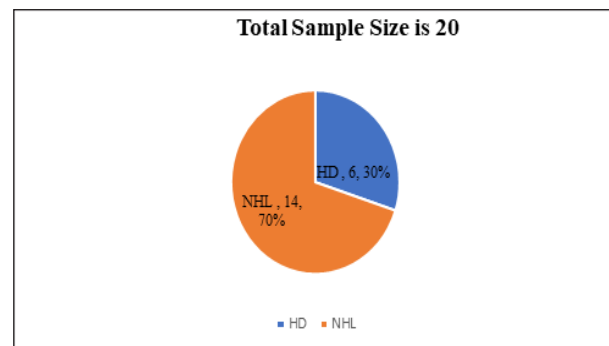
The patients were selected from the Hematology OPD and the inpatient department, who were diagnosed with Lymphoma, came for follow-up, had therapy or were admitted with complications. Data was collected by interviewing parents and checking the order for chemotherapy and investigation report, along with the money receipt of investigations and the medicine cost was calculated from money receipt of the medicine store. All data were noted in the prepared questionnaire form and the cost of treatment of the individual patient was calculated. Survey questionnaire, Chemotherapy protocols, Money Receipt for Investigation, and Purchase receipts of Medicine were used as Data Gathering Instrument. Informed written consent was taken from the parents of the patients. There has not been any ethical

compromise in the preparation of this report nor there is any possibility of any harm for anybody from the dissemination of this report.

## Result:

### Demography :

The study covered 20 patients of lymphoma of which 14 were NHL. Among 14 NHL cases where (M: F = 9: 5), the age range of 2-14 years (Mean age 8 years). On the other hand, 6 were HD (M: F = 4:2) in the age of 9-14 years (Mean Age 11.5 years). Body Surface Area (BSA) in NHL cases Range ( 0.42 – 1.45) Mean: 0.9, where BSA in HD: Range (0.9 - 1.32) Mean age: 1.11



### A. Cost analysis of NHL:

Out of the 14 NHL group, mediastinal mass (Lymphoblastic type) were 4 who were treated under BFM- 90 protocol and rest were with abdominal mass or enlarged tonsil (Small non-cleaved type) treated under LMB-96 protocol.

➤ Treatment cost of the LMB-96 protocol includes the following stages:

- ✓ Investigation
- ✓ Treatment cost of chemotherapy and general medicine in 9 cycles
- ✓ In case of Complication: Investigation, Blood Transfusion and antibiotics

- Treatment cost of BFM-90 Protocol includes:
- Induction phase (treatment lasts for 64 days) - Includes investigation, chemotherapy and general medicine
- Intensification Phase (treatment days are 56 ) - Includes investigation, chemotherapy and general medicine
- Maintenance phase (treatment for 02 years, with no admission in hospital) - Includes investigation, chemotherapy and general medicine o In case of Complication: Investigation, Blood Transfusion and antibiotics

#### B. Cost analysis of HD:

Among the 6 HD of the study, 4 patients were treated with ABVD protocol (stage I & II disease and 2 patients were treated with Hybrid protocol ( stage III & IV)

- Hybrid protocol was given for 6 months. In Hybrid

protocol, MOPP regimen was for 15 days in every month, then ABVD protocol was for last 15 days of every month till 6 months.

- ABVD protocol was given for 6 months. here only ABVD regimen was given for twice in a month for 6 months.

#### Summary on Treatment Cost for LMB-96:

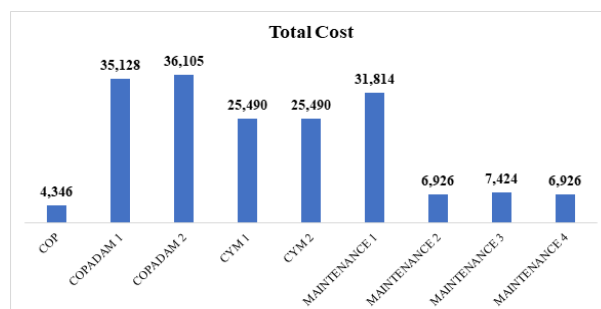
From the study, it was found that the total direct medical treatment of LMB- 96 over a period of 8 months costs a patient around BDT 180,000 as depicted in the Table 1 and figure 1 below.

It revealed that out of the total cost, Chemotherapy is the main component, where around BDT 150,000 is needed (around 84%) of the treatment cost, while Investigation cost is around BDT 16,900 (around 9%), General Medicine cost is around BDT 7,000 and other cost is around BDT 7,400.

**Table 1: Analysis of the cost of treatment under LMB- 96 Protocols of NHL**

Name of Cycle	Investigation Cost	Chemotherapy Cost	General Medicine Cost	Other Cost	Total Cost
COP	1880	870	777	819	4,346
COPADAM 1	1880	31,652	777	819	35,128
COPADAM 2	1880	32,629	777	819	36,105
CYM 1	1880	22,012	777	819	25,490
CYM 2	1880	22,014	777	819	25,490
MAINTENANCE 1	1880	28,338	777	819	31,814
MAINTENANCE 2	1880	3,450	777	819	6,926
MAINTENANCE 3	1880	3,948	777	819	7,424
MAINTENANCE 4	1880	3,450	777	819	6,926
Total	16,920	1,48,365	6,993	7,371	1,79,649

NB: Details is given in the annex as supplementary data.



In graphic presentation, the cost of treatment at each cycle LMB-96:

**Table 2: Treatment Cost for BFM-90**

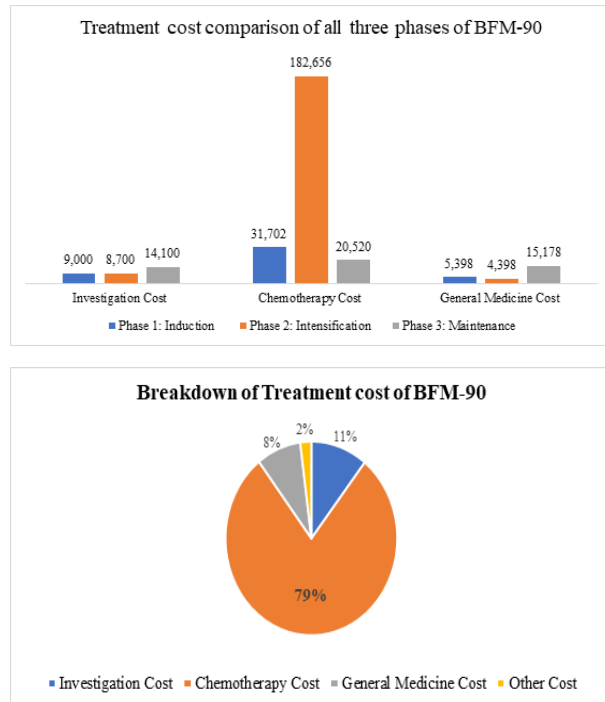
Name of Cycle	Investigation Cost	Chemotherapy Cost	General Medicine Cost	Other Cost	Total Cost
Induction	9,000	31,702	5,398	1,056	47,156
Intensification	8,700	182,656	4,398	1,056	198,810
Maintenance	14,100	20,520	15,178	4,075	53,873
	31,800	234,878	24,974	6,187	297,839

#### Summary of the Treatment Cost for BFM-90:

From the study, we find that the total medical treatment of BFM 90 over a period of 27 months costs a patient around BDT 298,000 as depicted in the Table 2.

It revealed that out of the total cost, Chemotherapy is the main component where around BDT 235,000 is needed which is around 80% of the treatment cost while Investigation cost is around BDT 32,000 (around 11%), General Medicine cost is around BDT 25,000 and other cost is around BDT 6,000.

The figure below shows the treatment cost of BFM-90 at each phase. It may be noted that Chemotherapy at the Intensification stage contributes the biggest cost, around 60%.



NB. Detail analysis of the cost of treatment under BFM-NHL 90 protocol is given in the supplementary data.

## Summary of Treatment Cost of Hybrid and ABVD for 6 months:

### Hybrid:

The total direct medical treatment of Hybrid over 6 months costs a patient around BDT 102,000 as depicted in Table 3 below.

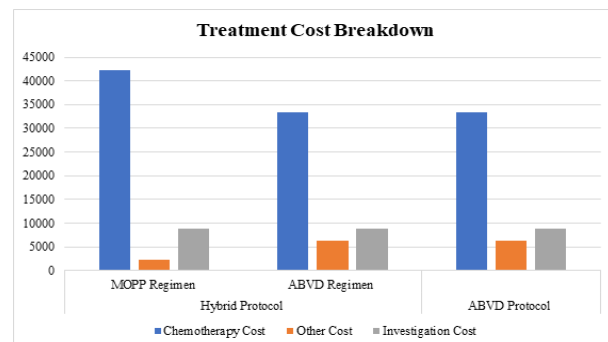
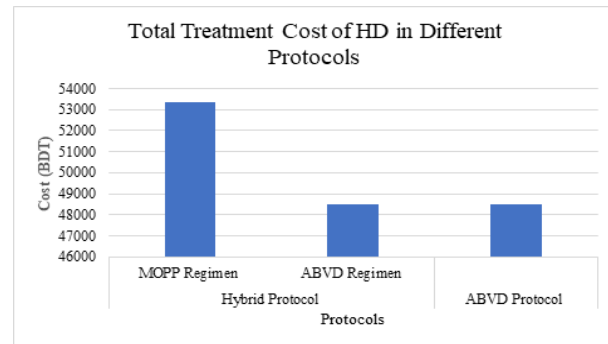
The study revealed that out of the total cost, treatment of the MOPP Regimen takes around BDT 53,350, while ABVD Regimen takes around BDT 48,500. In both cases, Chemotherapy is found to be the main component.

### ABVD:

ABVD protocol on the other hand cost around BDT 48,500.

**Table 3: Treatment Cost of Hybrid and ABVD**

	Hybrid Protocol		ABVD Protocol
	MOPP Regimen	ABVD Regimen	
Chemotherapy Cost	42,312	33,420	33,420
Other costs	2,280	6,336	6,336
Investigation cost	8,760	8,760	8,760
Total	53,352	48,516	48,516



NB. Detailed analysis of the cost of treatment under the MOPP Regimen and ABVD Regimen is given in the supplementary data.

**Table 4: Treatment cost in case of complication:**

	Name of Medicine	Quantity	Unit Cost	Total Cost
A.	<b>General Medicine</b>			777
B.	<b>Antibiotic</b>			
	Inj. Cefepime	54	300	16,200
	Inj. Amikacin	64	16	1,024
	Inj. Vancomycin	9	480	4,320
	Tab. Acyclovir	16	22	352
	Syrup Nitazoxanide	1	35	35
C.	<b>Investigation</b>			
	CBC	5	100	500
	Blood CS	1	800	800
	Urine CS	1	500	500
	S. Creatinine	5	70	350
	SGPT	5	80	400
	S. Calcium	5	80	400
	Chest X-Ray	1	250	250
	USG	1	350	350
D.	<b>Blood Transfusion</b>	2	1000	2,000
	<b>Total</b>			28,258

**Diagnosis Cost,** As found from the interview of the patients, was found to be around BDT 20,000- 50,000, including all investigations, doctor's visit and surgery.

**Follow-up cost:** After treatment in each protocol, patients

are required to be under follow-up for 5 years, where the main costs come from different investigations. In the NHL, such follow-up cost comes around BDT 6,600, while for NH follow-up cost comes around BDT 15,000. A brief assessment was also done for Indirect cost (as transportation and accommodation/seat rent etc.) which vary widely depending upon the place of residence of the patient, and hence were excluded from our report

### Discussion:

There are very few studies regarding the treatment cost of lymphoma in children abroad. An Australian study shows that lymphoma is the 6th most expensive (estimated at US\$ 12,040) cancer which is around 6% of their total healthcare cost.<sup>4</sup> As per Turkish study, direct medical cost for H.D. comes around USD 3,371. Another study in South Africa shows the treatment cost of H.D. (stage-2) comes around USD 6,647.27. No published data is available in our country on this topic till now.<sup>5</sup>

One study was done in Bangladesh Medical University (former BSMMU) during 2010-2011 regarding the Cost of treatment for children with acute lymphoblastic leukemia in Bangladesh. During the period of this study, treatment abandonment rates were 16%; 62% of which were reported to be due to families not being able to afford the costs. But here in our study, there was no such case of treatment abandonment.<sup>6</sup>

Another study done in Canada shows that for first-line treatment, drug cost was the largest contributor to total cost, followed by hospitalization cost.<sup>7</sup> Hospitalization and transplantation costs were the two largest constituents of total costs subsequent to first-line treatment, followed by drug cost. Patients with advanced stage disease cost significantly more than patients with limited stage disease.<sup>8</sup>

**Limitations:** Chemotherapy drug cost shown in the result is calculated based on the patient's body surface area (BSA) of 1 sqm. The cost will vary with the surface area of the patient. The cost of Chemotherapy shown in the result may vary between manufacturers' rate. The study prepared based on BSMMU rates, which will vary outside.

**Conclusion:** The treatment cost for Non-Hodgkin Lymphoma comes around BDT 180,000 – 298,000 while for Hodgkin Disease it comes around BDT 48,500-102,000. Under NHL for studied patient with BSA ranging 0.42-1.45 sqm, the cost of treatment will range for LMB 86 BDT 93,596 - BDT 246,213 while for BFM 90 BDT 168,656 – 403,534. Under HD, for studied patient with BSA ranging 0.90-1.32 sqm, the cost of treatment will range for Hybrid protocol BDT 94,300 - BDT 126,100 while for ABVD protocol BDT 45,200 – BDT 59,200. In case of complication like Septicaemia, additional treatment cost comes around BDT 28,258 for each episode of complication.

**Recommendation:** The treatment cost appeared burdensome for low-income people of Bangladesh. The main cost for the treatment of Lymphoma is for Chemotherapy and Investigation. Studies abroad showed a similar observation. So, to reduce the burden of cost: Unnecessary investigation should be avoided. Policy makers should give emphasis on reducing the cost of Chemotherapy in Bangladesh.

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