# Analysis of Survival of Patients with Chronic Myeloid Leukemia Treated with Imatinib in the Last 15 Years in Lebanon

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## Abstract

**In the 2000s, the introduction of the tyrosine kinase inhibitor, imatinib, improved the survival outcomes of patients with chronic myeloid leukemia (CML). In Lebanon, we rapidly adopted this treatment strategy. We retrospectively reviewed the medical records of 46 patients diagnosed with CML and treated with front-line imatinib 400 mg/day from 2000 and followed up to 2015. The achievement of a major molecular response and complete cytogenetic response and overall survival, progression-free survival, and event-free survival were similar to previous published data.**

**Background:** In the 2000s, the introduction of the tyrosine kinase inhibitor (TKI), imatinib, improved the survival outcomes of patients with chronic myeloid leukemia (CML). In Lebanon, we rapidly adopted this treatment strategy. To the best of our knowledge, this is the first study reporting the survival rates of Lebanese CML patients. We examined the rates of major molecular response (MMR) and complete cytogenetic response (CCyR) and analyzed the overall survival, progression-free survival, and event-free survival of CML patients treated with front-line imatinib in 3 university hospitals in Lebanon. **Patients and Methods:** We retrospectively reviewed the medical records of 46 patients diagnosed with CML and treated with front-line imatinib 400 mg/day from 2000 and followed up to 2015. In all patients, initially, 2 diagnostic tests were performed: cytogenetic analysis and qualitative molecular testing of the BCR-ABL transcript. The male-to-female sex ratio was 3:1. The median age at diagnosis was 49 years, and the mean age was 44.52 years. At diagnosis, 46 patients were in the chronic phase. All patients started imatinib 400 mg/day. Of the 46 patients, 35 had a typical karyotype, 8 an atypical karyotype, and 3 hypoploidism. **Results:** The MMR rate at 18 months was 58.69%. The cumulative CCyR rate at 18 months of therapy with imatinib at the standard dose was 67.39%. The event-free survival rate was 75.86% and 74.14% at 5 and 8 years, respectively. The progression-free survival rate was 77.59% and 75.86% at 5 and 8 years, respectively. The overall survival rate was 98.27% and 98.27% at 5 and 8 years, respectively. Of the 46 patients, 12 developed disease progression and were salvaged by second-generation TKIs. These 12 patients were still alive with a MMR. **Conclusion:** In our study population, the achievement of a MMR and CCyR and overall survival, progression-free survival, and event-free survival were similar to previous published data. Reaching high survival rates with a first-generation TKI in a country with limited resources is a reasonable treatment approach for CML patients.

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**Keywords:** Analysis of survival, CML, Event free survival, Overall survival, Progression free survival

## Introduction

The introduction of the tyrosine kinase inhibitor (TKI), imatinib mesylate, which specifically targets the tyrosine kinase activity of the oncogenic proteins encoded by BCR-ABL1, has shown a superior response rate and improved progression-free survival compared with the previous standard therapy of interferon-alfa plus low-dose

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**Table 1** Baseline Patient Characteristics (n = 46)

| Characteristic | n (%) |
|---|---|
| Gender | |
| Male | 34 (74) |
| Female | 12 (26) |
| Median age (y) | 49 |
| Cytogenetic | |
| Typical | 35 (76) |
| Atypical | 8 (17) |
| Hypoploidism | 3 (7) |
| Molecular testing PCR (BCR-ABL) | 46 (100) |
| CML phase at diagnosis | |
| Chronic phase | 46 (100) |
| Accelerated phase | 0 (0) |
| Blastic phase | 0 (0) |
| Imatinib 400 mg/day | 46 (100) |

Abbreviations: CML = chronic myeloid leukemia; PCR = polymerase chain reaction.

cytarabine[1-3] and has improved the survival outcomes of CML patients. This had rapidly and dramatically modified the treatment of CML and led to important changes in the management.

Lebanon is a small country in the Middle East region with an estimated population of 4.5 million. The crude incidence rate for cancer in 2003 was 177.3 new cases per 100,000 habitants. At that time, the reported number of patients with CML was only 31 patients. As occurred elsewhere, we rapidly modified our medical practice and started treating all patients with CML with imatinib. In the present review, we report the survival of Lebanese CML patients receiving imatinib.

## Patients and Methods

We retrospectively reviewed the medical records of 46 patients diagnosed with CML and treated with front-line imatinib from 2000 and followed up to 2015. In all patients, initially 2 diagnostic tests were performed: cytogenetic analysis and qualitative molecular testing of the BCR-ABL transcript. All patients received imatinib treatment at 400 mg/day.

Data were collected by reviewing the medical records of all patients, and the data were input into an Excel spreadsheet (Microsoft Excel 2010; Microsoft, Redmond, CA). The specifications included separate sections such as demographic data, disease characteristics, monitoring data, and response type at specific intervals as recommended by the European LeukemiaNet CML guidelines. The process of data collection was completed in March 2015 and the statistical analysis in April 2015. Survival data were studied by establishing survival curves using the Kaplan-Meier method. The inclusion criteria were age >18 years, a confirmed diagnosis of chronic phase CML, and treatment with imatinib 400 mg as first-line therapy from January 2000 to January 2015. The exclusion criteria were CML treated previously by interferon, cytarabine, or hydroxyurea, treatment with front-line second-generation TKI therapy, and medical records lacking cytogenetic and molecular monitoring, making the response evaluation impossible. The criteria established by the European LeukemiaNet group were used to determine the definitions of cytogenetic and molecular responses and the progression to an accelerated phase or blastic phase.[2]

The baseline characteristics of the patients are summarized in Table 1. We included 46 newly diagnosed patients with chronic phase CML treated by front-line imatinib 400 mg/day (34 men and 12 women) from 2000 to 2015 in the present study. The median age at diagnosis was 49 years, and the mean age was 44.52 years. Of the 46 patients, 35 had typical karyotypes, 8 had atypical karyotypes, and 3 had hypoploidism. The yearly repartition of newly diagnosed patients is shown in Figure 1.

The objective of the present study was to report the efficacy of imatinib in the real-life experience of Lebanese CML patients. We analyzed the data on the cytogenetic response, molecular response, event-free survival, progression-free survival, and overall survival.

**Figure 1** Repartition of Patients by Year of Diagnosis