Clinical Outcomes of AML1-ETO–Positive Acute Myeloid Leukemia in Adolescents and Young Adults (AYA): A Single-Center Experience from Pakistan

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Introduction

- AML1-ETO (RUNX1::RUNX1T1) AML is ELN 2022 favorable-risk.
- Relapse and treatment-related mortality remain major challenges.
- Real-world AYA outcomes from resource-limited settings are poorly characterized.

Aim

To assess outcomes in AYA patients with AML1-ETO-positive AML treated at SKMCH&RC, Pakistan.

Methods

- Retrospective, single-center study.
- AYA patients (18–25y) with AML1-ETO+ AML, Mar 2020–Aug 2025.
- Excluded therapy-related / secondary AML.
- DA 3+7 induction (1–2 cycles) → 3 cycles cytarabine consolidation.
- Primary endpoints: OS and DFS (Kaplan–Meier, 2-yr rates).
- Secondary endpoints included:
  - Complete remission (CR) rate
  - Relapse patterns (hematologic and molecular)
  - ETO persistence
  - Cause of death

At a Glance

30 AYA patients	**19 yrs** Median age
100% Overall CR rate	**40.3%** 2-yr OS
33.2% 2-yr DFS	**53.3%** Overall mortality

Results

Patient Characteristics

Characteristic	Value
Median age, years (range)	19 (18–23)
Male : Female ratio	1.73 : 1
BM Blast % mean (range)	46.5% (15–84%)
AML subtype — M1/M2, n (%)	30 (100%)
t(8;21) alone, n (%)	22 (73.3%)
t(8;21) + del(9), n (%)	5 (16.7%)
t(8;21) not detected, n (%)	3 (10.0%)
AML1-ETO positive, n (%)	30 (100%)
ETO + c-KIT co-mutation, n (%)	2 (6.7%)

Treatment Response

Outcome	Value
Induction-related mortality	4/30 (13.3%)
Overall CR after induction	26/26 (100%)
PCR-negative after induction, n/26 (%)	13 (50.0%)
CR after consolidation	25/26 (96.2%)
PCR-negative after consolidation	20/26 (76.9%)
ETO/PCR persistence after consolidation	6/26 (23.1%)
Overall relapse rate, n/26 (%)	10/26 (38.4%)
Both hematologic + molecular	9
Hematologic-only relapse	1

Mortality & Survival

Outcome	Value
Overall mortality, n/30 (%)	16 (53.3%)
Leading cause of death — sepsis	9/16 (56.3%)
2-yr Overall Survival (95% CI)	40.3% (21.8–58.2%)
2-yr Disease-free Survival (95% CI)	33.2% (16.2–51.2%)
Alive at last follow-up (overall), n/30 (%)	14 (46.7%)
Relapsed patients — alive / died, n/10 (%)	2 (20.0%) / 8 (80.0%)
Died after relapse (no transplant), n/6	6
Reached allogeneic SCT in CR2, n/10 (%)	4 (40.0%)
— Alive after SCT, n/4 (%)	2 (50.0%)
— Died after SCT (TRM), n/4 (%)	2 (50.0%)

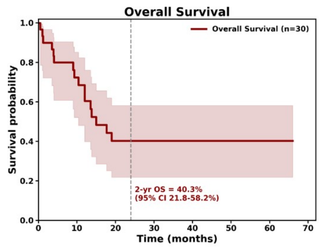

Fig 1. Overall survival (n=30). 2-yr OS = 40.3%.

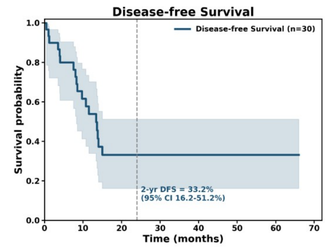

Fig 2. Disease-free survival (n=30). 2-yr DFS = 33.2%.

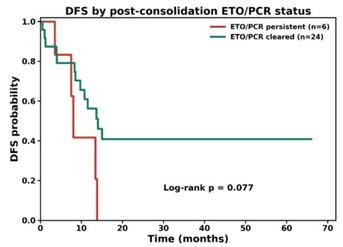

Fig 3. DFS by post-consolidation ETO/PCR status (log-rank p = 0.077).

OS — Univariate Predictors

Variable	Groups	p	HR (95% CI)
Gender	F(11) vs M(19)	0.313	1.79 (0.57–5.59)
Age group	≥20y vs <20y	0.922	0.96 (0.36–2.58)
AML subtype	M1/M1-M2 vs M2	0.064	2.55 (0.91–7.11)
PCR/ETO post-induction	Pos vs Neg	0.060	3.05 (0.91–10.26)
PCR/ETO post-consolid.	Pos vs Neg	0.119	2.56 (0.76–8.62)
Consolidation cycles	**<3 vs 3**	**<0.001**	**5.97 (2.05–17.41)**
Relapse status (landmark)	No vs Yes	0.068	2.76 (0.89–8.51)

DFS — Univariate Predictors

Variable	Groups	p	HR (95% CI)
Gender	F(11) vs M(19)	0.161	2.19 (0.71–6.73)
Age group	≥20y vs <20y	0.983	1.01 (0.40–2.57)
AML subtype	M1/M1-M2 vs M2	0.190	1.86 (0.72–4.79)
PCR/ETO post-induction	Pos vs Neg	0.173	2.07 (0.71–6.00)
PCR/ETO post-consolid.	**Pos vs Neg**	**0.017**	**3.63 (1.17–11.27)**
Consolidation cycles	**<3 vs 3**	**0.004**	**3.74 (1.43–9.80)**

Conclusion

- **OS was only 47% despite AML1-ETO's favorable-risk label — outcomes resembled intermediate-risk disease.**
- **Induction was highly effective (86.7% CR), matching international core-binding-factor AML benchmarks.**
- **Post-consolidation ETO/PCR persistence — or re-appearance after negativity — should prompt early referral for allogeneic HCT (HR 3.63, p=0.017).**
- **Sepsis was the leading cause of death — supportive-care infrastructure needs strengthening.**
- **Cost limits routine co-mutation testing; affordable molecular diagnostics are needed.**

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