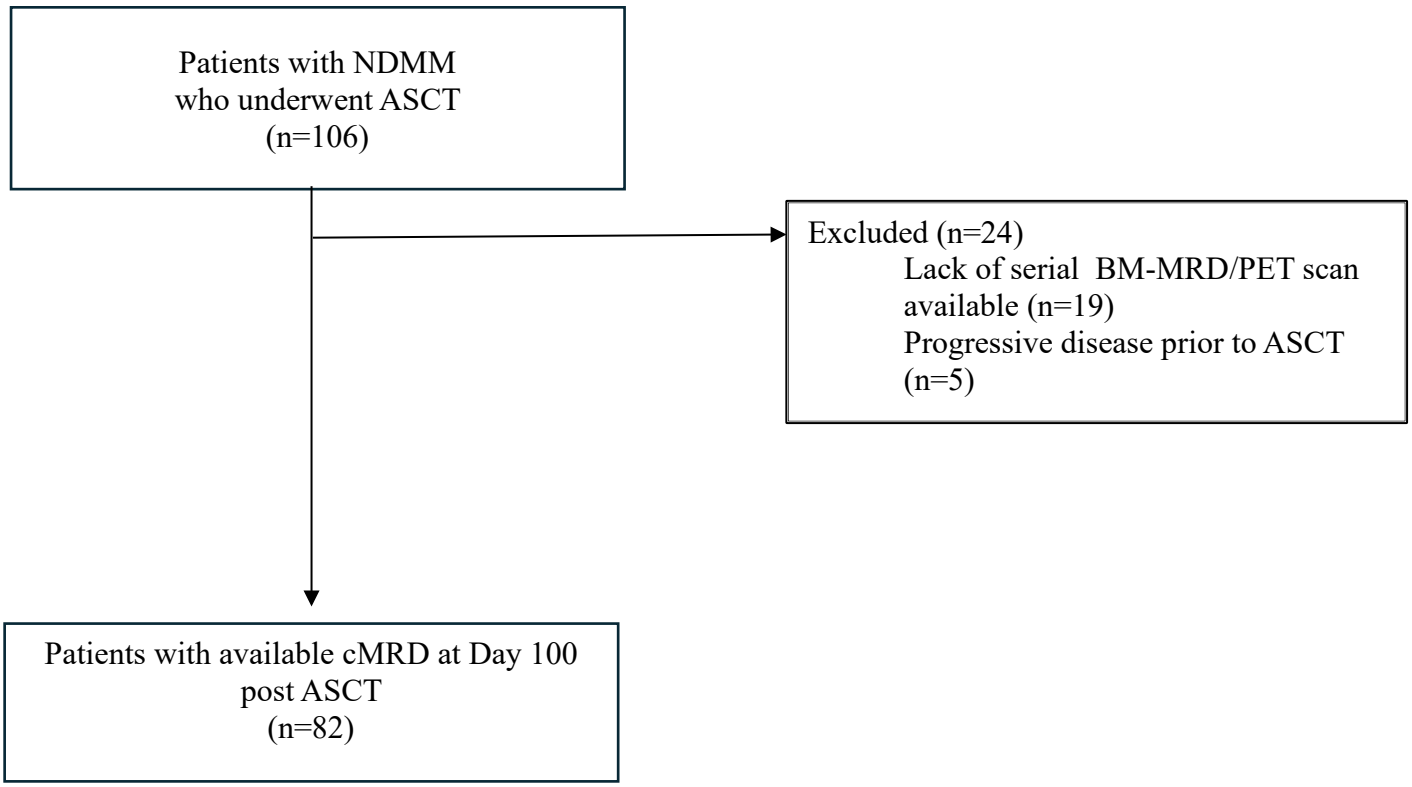
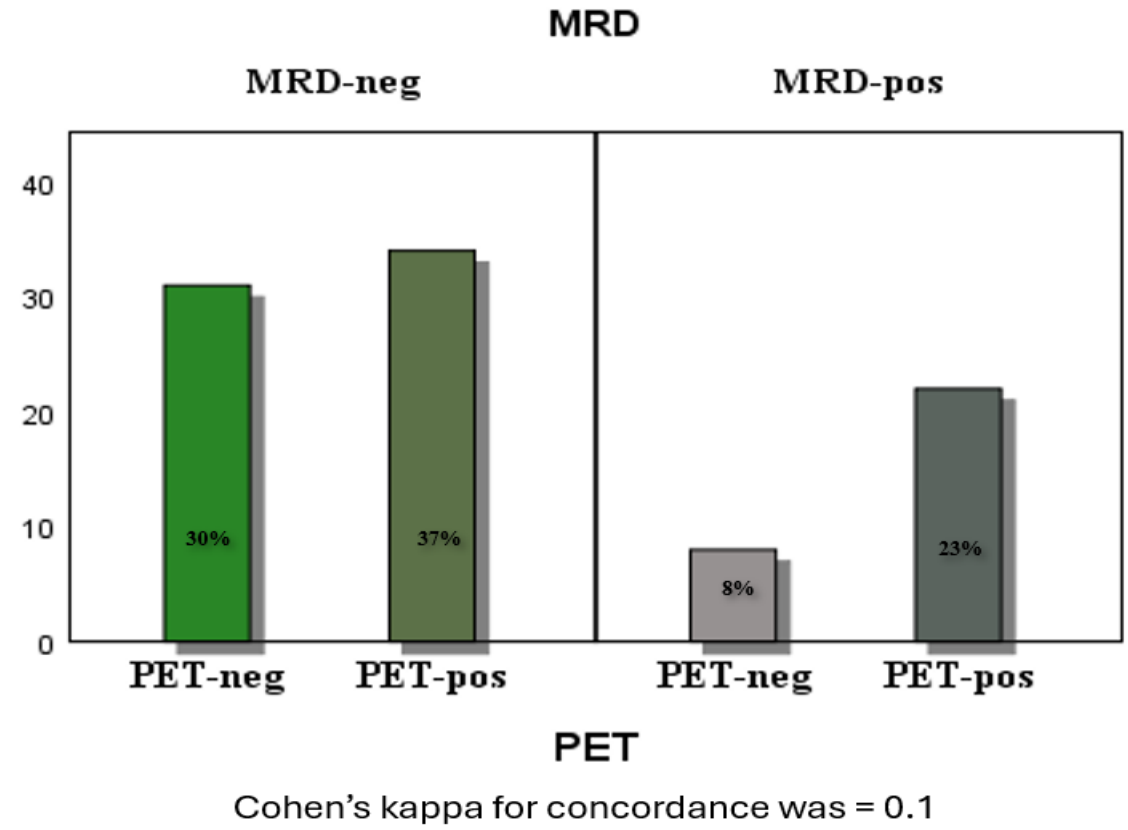
Supplementary Figure 1: Consort diagram of study



Supplementary Table 1: Comparison of baseline characteristics among the cMRD negative and positive group at both time point

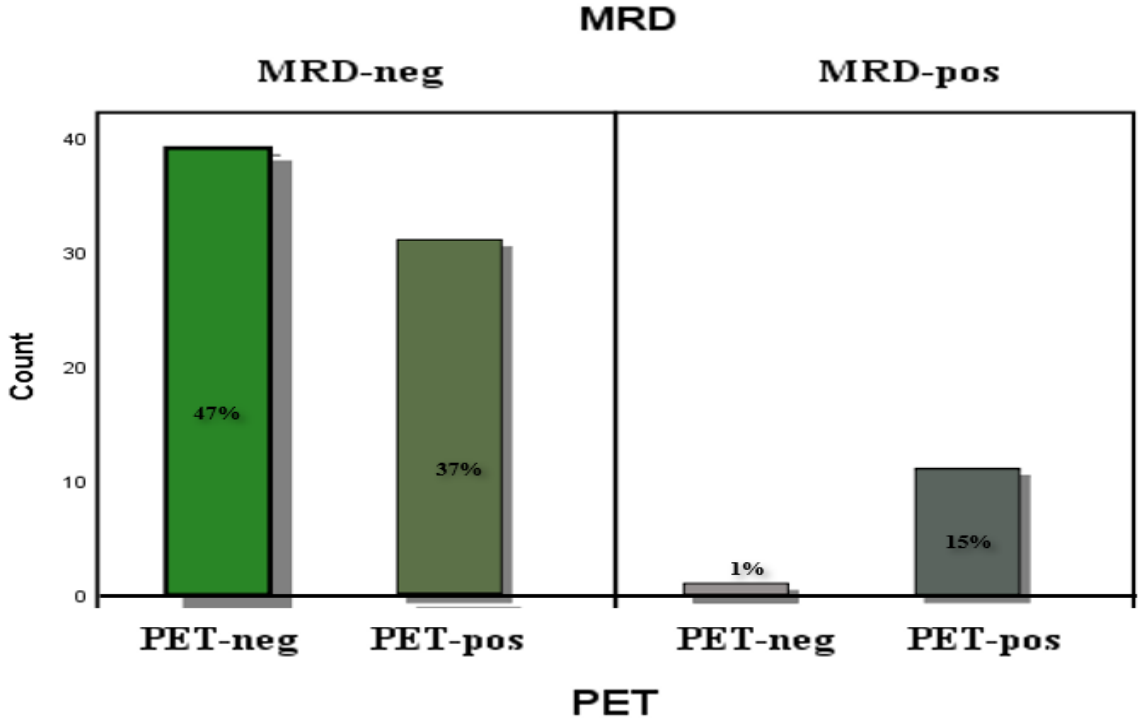
Baseline characteristics		**cMRD^{PRE-} N=25**	**cMRD^{PRE+} N=57**	**P value**	**cMRD^{POST-} N=39**	**cMRD^{POST+} N=43**	**P Value**
Median Age (IQR)		56(48-60)	53(49.5-59)	0.89	53(51-60)	54(46-60)	0.58
Renal impairment at diagnosis (n,%)		12(48)	19(33)	0.226	19(49)	12(28)	0.069
HRCA at diagnosis * (n,%)		5(20)	13(22)	1.00	8(20.5)	10(23.3)	0.79
ISS(n,%)	1 2 or 3	6(24) 19(76)	10(47(	0.9	12 27	7 36	0.139
Initial treatment (n,%)	VRd VCd VTd Dara-VRd	8(32) 9(36) 4(16) 4(16)	28(49) 21(37) 5(9) 3(5)	0.22	15(38) 17(43.5) 4(10) 3(7.5)	22(52) 13(30) 4(9) 4(9)	0.61
Median duration of treatment in month prior to ASCT(IQR)		11(8.4-14)	11(8-19.5)	0.74	12(9-18)	11(7-18)	0.44
Duration of anti-myeloma therapy pre-ASCT <6 months [n,%] ≥ 6 months [n,%]		 3(12) 22(88)	 10(17.5) 47(82.5)	0.4	 3(7.7) 36(92.3)	 10(23.2) 33(76.8)	0.054
Prior line Treatment (n,%) 1 2or more		 20(80) 5(20)	 43(75) 14(25)	0.262	 32(82) 7(18)	 31(72) 12(28)	0.192
Response pre-ASCT (n,%) CR Not in CR		 18(72) 7(18)	 31(54.5) 26(45.5)	0.151	 26(67) 13(33)	 23(54) 20(47)	0.264
Maintenance (n,%) Singlet IMID PI Doublet(IMID and PI)		 21(84) 1(4) 2(8)	 35(66) 7(13) 11(21)	0.145	 30(76) 5(14) 4(10)	 26(60) 3(7) 9(21)	0.260

Supplementary Figure 2 (A): Bar diagram representing the concordance between BM-MRD and PET-CT at the pre-ASCT time point S2a and S2b



Cohen's kappa for concordance was = 0.1

Supplementary Figure 2 (B):

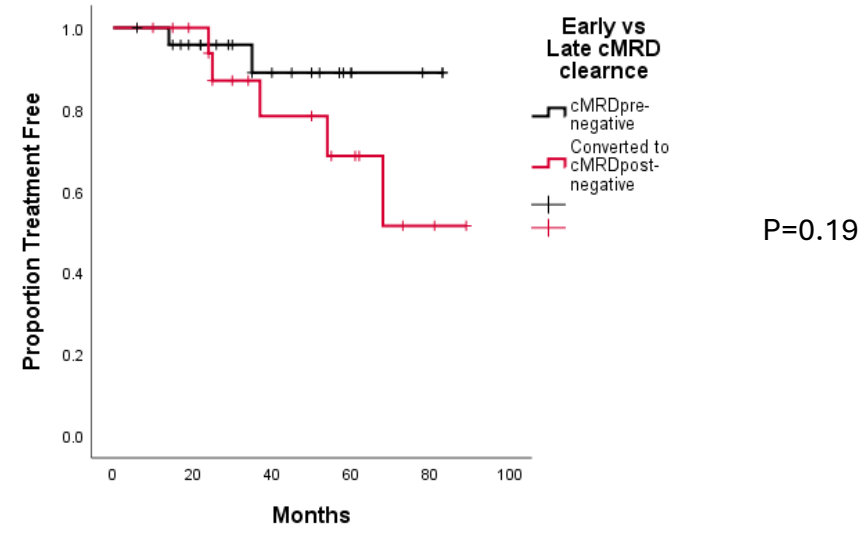


Cohen's kappa for concordance was = 0.23

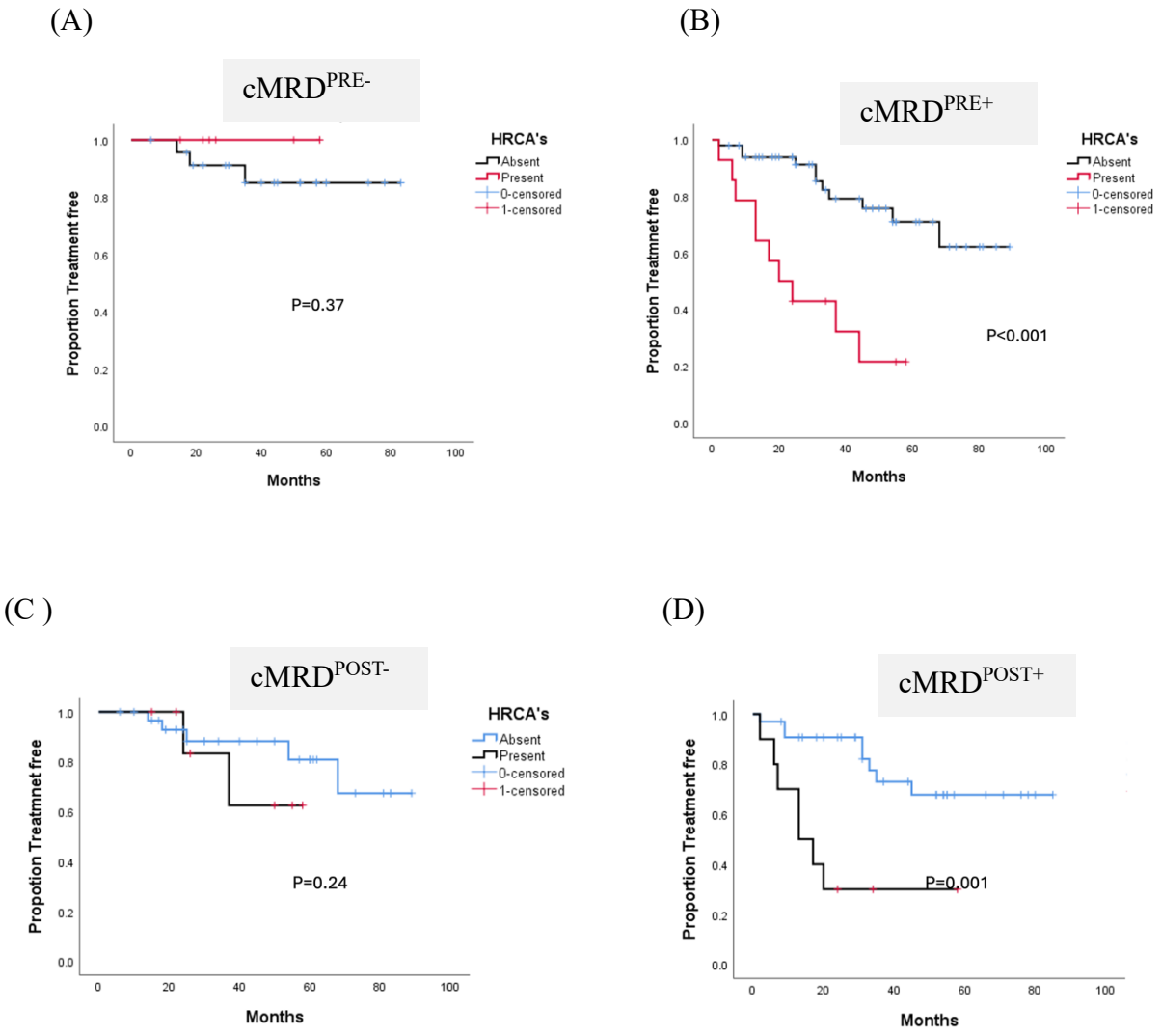
Supplementary Table 2: Estimated Time to next treatment and Overall Survival in the study population amongst various MRD response categories

	Proportion Treatment free at 3 year (%,SE)	**P value**	**Proportion Surviving at 3 year (%,SE)**	**P value**
Pre ASCT BM-MRD- BM-MRD+	 84± 5 59 ± 10	0.002	 86 ± 6 92± 3	0.24
Pre ASCT PET-CT- PET-CT+	 86 ± 7 69 ± 7	0.128	 93 ± 3 88 ± 4	0.30
Post ASCT BM-MRD- BM-MRD+	 80±5 42±10	0.02	 90±4 72±9	0.042
Post ASCT PET-CT- PET-CT+	 79±7 68±7	0.28	 94±2 85±5	0.16
Pre ASCT MRD-PET- Either Positive MRD+PET+	 88±6 75± 8 53± 11	0.002	 91±3 95± 2 80± 8	0.15
Post ASCT MRD-PET- Either Positive MRD+PET+	 82±7 70±9 48±16	0.089	 92±5 90±5 70±14	0.02
$cMRD^{PRE-}$ $cMRD^{PRE+}$	 91±4 67±6	0.009	 92±3 85±5	0.16
$cMRD^{POST-}$ $cMRD^{POST+}$	 82±7 65±7	0.116	 92±5 85±5	0.169

Median follow-up 35 months (22-58)
*ASCT- Autologous Stem Cell Transplant, MRD- Minimal Residual Disease by BM FCM, cMRD- integrated MRD



Supplementary Figure 3: Kaplan Meir survival analysis for TTNT stratified according to early cMRD negativity defined by $cMRD^{PRE-}$ vs late cMRD negative (Those having $cMRD^{PRE+}$ but converted to $cMRD^{POST-}$)



Supplementary Figure 4: (A) Kaplan Meir showing TTNT stratified according to presence or absence of HRCA's at diagnosis among (A)cMRD^{PRE-} cohort, (B) cMRD^{PRE+} cohort, (C) cMRD^{POST-} cohort, (d)cMRD^{POST}

Supplementary Table 3: summarises salient studies that have analysed the role of PET CT at various time points

Study (Year)	Induction strategies	Timing of PET/CT	PET-Negativity Rate	Key Findings
CASSIOPET (2021) (n=	4 cycles Dara VTD/VTD +ASCT +2 cycles DaraVTD/VTD	After consolidation, before maintenance	64%*	PET-negativity associated with better progression-free survival (PFS); PET/CT negativity is a strong prognostic marker.
Zamagni et al. (2015) (n=282)	Conventional chemotherapy based , Bortezomib based and Thalidomide based	3 month post ASCT	70%	PET-negativity observed in 70% of patients; associated with improved PFS and OS.
Kaddoura et al. (2021) n=229 patients)	Conventional chemotherapy based , Bortezomib based and Thalidomide based	Day 100 post-ASCT	35%	PET-negativity at day 100 post-ASCT associated with longer time to progression (TTP) and OS.
Imajem study (July 2017) N=155 patients (63 received ASCT)	3 cycles VRd +ASCT+2 cycles VRd	At pre-maintenance	75%	PET-negativity at maintenance associated with better PFS
Current study(N=82)	Median 11 cycle of VRd /VCd +ASCT	Pre Transplant and Day 100 post ASCT	Pretransplant 38% Day 100-49%	PET negativity before ASCT associated with longer Time to next treatment