## SUPPLEMENTARY

### Supplementary Table 1. Comparison of Survival Outcomes (DFS, LRFS, DMFS, CSS, OS) According to Clinicopathological Variables

| Variables | DFS (p) | LRFS (p) | DMFS (p) | CSS (p) | OS (p) |
|---|---|---|---|---|---|
| Sex (Male vs Female) | 0.666 | 0.983 | 0.435 | 0.313 | 0.653 |
| Histological subtype (non-keratinizing, differentiated vs non-differentiated) | **0.016*** | 0.400 | 0.373 | 0.195 | **0.002*** |
| Headache (Present vs Absent) | 0.387 | 0.173 | 0.412 | 0.514 | 0.638 |
| Neck swelling (Present vs Absent) | 0.625 | 0.720 | 0.682 | 0.074 | 0.325 |
| Visual disturbance (Present vs Absent) | 0.536 | 0.932 | 0.237 | 0.215 | 0.571 |
| Hearing loss (Present vs Absent) | 0.764 | 0.777 | 0.765 | 0.691 | 0.901 |
| Nasal symptoms (Present vs Absent) | 0.431 | 0.990 | 0.585 | 0.908 | 0.371 |
| T stage (T1–T4) | 0.873 | 0.556 | 0.808 | 0.869 | 0.419 |
| N stage (N0–N2) | 0.847 | 0.315 | 0.645 | 0.206 | 0.749 |
| Family history of cancer (Yes vs No) | **0.028*** | 0.533 | 0.607 | 0.999 | 0.174 |
| Comorbid systemic disease (Present vs Absent) | 0.525 | 0.252 | **0.027*** | 0.304 | 0.805 |
| Smoking status (Smoker vs Non-smoker) | 0.760 | 0.650 | 0.224 | 0.594 | 0.496 |
| Alcohol use (Yes vs No) | 0.724 | 0.792 | 0.567 | 0.705 | 0.886 |

| | | | | | |
|---|---|---|---|---|---|
| Cisplatin use (Yes vs No) | 0.565 | 0.782 | 0.942 | 0.821 | 0.307 |
| Chemotherapy combination regimen (RT + Platinum; Platinum + 5-FU; Platinum + Gemcitabine; Platinum + Taxane; TPF regimen) | 0.780 | 0.586 | 0.053 | 0.648 | 0.597 |
| Induction/Adjuvant chemotherapy sequence | 0.295 | 0.141 | 0.937 | 0.845 | 0.310 |
| Treatment order (CT–CRT vs CRT–CT) | 0.260 | 0.628 | 0.933 | 0.128 | 0.068 |
| Concurrent chemoradiotherapy (Yes vs No) | 0.661 | 0.828 | 0.568 | 0.373 | 0.459 |
| TNM stage (II–IV) | 0.386 | 0.184 | 0.970 | 0.771 | 0.197 |
| RT initiation (Yes vs No) | 0.339 | 0.319 | 0.794 | 0.990 | 0.362 |

*Note: p-values < 0.05 are considered statistically significant and highlighted with an asterisk (*).

***Abbreviations:** CCRT = Concurrent Chemoradiotherapy; CSS= Cancer-Specific Survival; CT = chemotherapy; DFS= Disease-Free Survival; DMFS= Distant Metastasis-Free Survival; EBV = Epstein–Barr virus; LRFS= Locoregional Recurrence-Free Survival; OS=Overall Survival; RT = Radiotherapy; TNM= Tumor, Node, Metastasis; TPF = docetaxel–cisplatin–5-fluorouracil; 5-FU=5-fluorouracil

**Supplementary Table 2. Multivariable Cox Regression Analysis for Factors Associated with Locoregional Recurrence-Free Survival (LRFS)**

| Variable | p-value | Hazard Ratio (HR) | 95% CI for HR |
|---|---|---|---|
| **Hemoglobin (g/dL)** | 0.664 | 0.93 | 0.68–1.28 |

| Variable | p-value | Hazard Ratio (HR) | 95% CI for HR |
|---|---|---|---|
| Pan-immune-inflammation value (PIV) | 0.364 | 1.00 | 1.00–1.00 |
| Prognostic nutritional index (PNI) | 0.312 | 0.95 | 0.87–1.05 |
| Age at diagnosis (years) | 0.403 | 1.02 | 0.97–1.08 |

**Model significance:** *p = 0.394*

---

*Abbreviations: CI: confidence interval; Cox proportional hazards regression (Cox model); LRFS: locoregional recurrence-free survival; PIV: pan-immune-inflammation value; PNI: prognostic nutritional index.

**Notes:** None of the variables demonstrated a statistically significant association with locoregional recurrence-free survival. HR > 1 indicates an increased risk of locoregional recurrence.

**Supplementary Table 3. Multivariable Cox Regression Analysis for Factors Associated with Distant Metastasis-Free Survival (DMFS)**

| Variable | p-value | Hazard Ratio (HR) | 95% CI for HR |
|---|---|---|---|
| Age at diagnosis (years) | 0.525 | 1.01 | 0.97–1.06 |
| Hemoglobin (g/dL) | 0.145 | 0.79 | 0.58–1.08 |
| Pan-immune-inflammation value (PIV) | 0.767 | 1.00 | 1.00–1.00 |
| Prognostic nutritional index (PNI) | 0.743 | 1.01 | 0.93–1.10 |
| Comorbid systemic disease | **0.037** | **3.90** | **1.08–14.04** |

**Model significance:** *p = 0.190*

---

Abbreviations: CI: confidence interval; Cox proportional hazards regression (Cox model); DMFS: distant metastasis-free survival; PIV: pan-immune-inflammation value; PNI: prognostic nutritional index.

**Notes:** HR > 1 indicates an increased risk of distant metastasis.

**Supplementary Table 4. Multivariable Cox Regression Analysis for Factors Associated with Cancer-Specific Survival (CSS)**

| Variable | p-value | Hazard Ratio (HR) | 95% CI for HR |
|---|---|---|---|
| **Age at diagnosis (years)** | **0.017** | **1.05** | **1.01–1.10** |
| Hemoglobin (g/dL) | 0.359 | 0.88 | 0.67–1.16 |
| Pan-immune-inflammation value (PIV) | 0.136 | 1.00 | 1.00–1.00 |
| Prognostic nutritional index (PNI) | 0.968 | 1.00 | 0.94–1.07 |

**Model significance:** *p = 0.063*

Abbreviations: CI: confidence interval; Cox proportional hazards regression (Cox model); CSS: cancer-specific survival; PIV: pan-immune-inflammation value; PNI: prognostic nutritional index.

**Notes:** HR > 1 indicates an increased risk of cancer-specific mortality.

**Supplementary Table 5. Cox Regression Analysis for Factors Associated with Cancer-Specific Survival (CSS) — Age Evaluated Independently**

| Variable | p-value | Hazard Ratio (HR) | 95% CI for HR |
|---|---|---|---|
| Age at diagnosis (years) | **0.025** | **1.05** | **1.01–1.09** |

**Model significance:** ***p = 0.020***

---

Abbreviations: CI: confidence interval; Cox proportional hazards regression (Cox model); CSS: cancer-specific survival;

**Notes:** The variable *age at diagnosis* was evaluated independently, without inclusion of other covariates, as it demonstrated near-significant association in the multivariable model. HR > 1 indicates an increased risk of cancer-specific mortality.