Elderly Malnutrition Is Associated With Increased One- and Five-Year Risk of Fracture and Mortality: A Propensity-Matched National Cohort Study

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INTRODUCTION:

Malnutrition in older adults is a growing public health concern and has been linked to frailty, bone loss, and increased mortality. However, the impact of malnutrition on long-term skeletal outcomes and survival remains understudied. This study aimed to evaluate the association between malnutrition and the risk of fracture and all-cause mortality in elderly patients using a large, multi-institutional electronic medical record (EMR)–derived database.

METHODS:

We conducted a retrospective cohort study of patients aged ≥65 years using a multi-institutional EMR-derived database. Patients with a diagnosis of malnutrition were compared to those without malnutrition, excluding individuals with a history of prior fractures or polytrauma. Propensity score matching (1:1) was performed across demographic and clinical covariates including age, sex, race, hypertension, diabetes, chronic kidney disease, and liver disease. The primary outcomes were one- and five-year risks of incident fracture and all-cause mortality. Cox proportional hazards models were used to estimate hazard ratios (HRs) with 95% confidence intervals (CIs).

RESULTS:

After matching, 477,998 malnourished patients were compared to 477,998 controls with balanced baseline characteristics. At one year, malnourished patients had significantly elevated risk of overall fracture (7.8% vs. 3.9%, HR: 2.202, 95% CI: 2.164–2.241) and all-cause mortality (12.7% vs. 2.7%, HR: 5.121, 95% CI: 5.025–5.219). Notably increased risks were observed for femur (HR: 3.188), fragility (HR: 2.281), and pathologic fractures (HR: 3.399). At five years, fracture risk remained elevated (15.8% vs. 11.8%, HR: 1.670, 95% CI: 1.651–1.688), particularly for femur (HR: 2.073), pathologic (HR: 2.245), and fragility fractures (HR: 1.774). All-cause mortality was more than doubled in the malnutrition group (30.4% vs. 14.1%, HR: 2.690, 95% CI: 2.666–2.715).

DISCUSSION AND CONCLUSION:

Among elderly patients without prior fractures or polytrauma, malnutrition is independently associated with significantly increased risk of incident fracture and mortality at both one and five years. The disproportionately high risk of femur, pathologic, and fragility fractures underscores the skeletal vulnerability of this population. These findings highlight the need for early identification of malnutrition and targeted fracture prevention strategies in older adults.

Table 1: Demographic and Clinical Characteristics of Pediatric Patients With and Without Malnutrition Before and After Propensity Score Matching

Variable	Pre-Match Malnutrition (n = 15,792)	Pre-Match Control (n = 2,765,386)	Pre-Match P	Post-Match Malnutrition (n = 15,753)	Post-Match Control (n = 15,753)	Post-Match P
Age at Index (mean ± SD)	3.8 ± 3.6	4.8 ± 3.5	<0.001	3.8 ± 3.6	3.8 ± 3.7	0.786
Female	7,045 (44.6%)	1,299,873 (47.0%)	<0.001	7,029 (44.6%)	7,015 (44.5%)	0.874
Male	8,719 (55.2%)	1,462,493 (52.9%)	<0.001	8,697 (55.2%)	8,716 (55.3%)	0.83
Black or African American	3,100 (19.6%)	503,299 (18.2%)	<0.001	3,091 (19.6%)	3,110 (19.7%)	0.788
Hispanic or Latino	3,109 (19.7%)	527,378 (19.1%)	0.049	3,107 (19.7%)	3,117 (19.8%)	0.887
Hypertensive Diseases	1,246 (7.9%)	6,287 (0.2%)	<0.001	1,219 (7.7%)	1,239 (7.9%)	0.674
Diabetes Mellitus	166 (1.1%)	8,284 (0.3%)	<0.001	164 (1.0%)	158 (1.0%)	0.737
Chronic Kidney Disease	570 (3.6%)	3,044 (0.1%)	<0.001	561 (3.6%)	632 (4.0%)	0.036
Liver Disease	597 (3.8%)	2,525 (0.1%)	<0.001	577 (3.7%)	635 (4.0%)	0.089
Nicotine Dependence	10 (0.1%)	144 (0.0%)	<0.001	10 (0.1%)	10 (0.1%)	1
Cystic Fibrosis	131 (0.8%)	2,105 (0.1%)	<0.001	130 (0.8%)	158 (1.0%)	0.097
Type 1 Diabetes Mellitus	109 (0.7%)	7,733 (0.3%)	<0.001	108 (0.7%)	106 (0.7%)	0.891
Celiac Disease	30 (0.2%)	1,900 (0.1%)	<0.001	30 (0.2%)	24 (0.2%)	0.414
Cerebral Palsy	433 (2.7%)	8,785 (0.3%)	<0.001	432 (2.7%)	491 (3.1%)	0.049
Muscular Dystrophy	22 (0.1%)	988 (0.0%)	<0.001	22 (0.1%)	26 (0.2%)	0.563
Osteogenesis Imperfecta	11 (0.1%)	418 (0.0%)	<0.001	11 (0.1%)	10 (0.1%)	0.827
Lymphoid Leukemia	741 (4.7%)	1,958 (0.1%)	<0.001	712 (4.5%)	619 (3.9%)	0.009
Myeloid Leukemia	121 (0.8%)	336 (0.0%)	<0.001	114 (0.7%)	85 (0.5%)	0.039
Monocytic Leukemia	19 (0.1%)	40 (0.0%)	<0.001	16 (0.1%)	10 (0.1%)	0.239
Other Leukemias	35 (0.2%)	87 (0.0%)	<0.001	33 (0.2%)	23 (0.1%)	0.181
Unspecified Leukemia	394 (2.5%)	470 (0.0%)	<0.001	373 (2.4%)	275 (1.7%)	<0.001
Noninfective Enteritis and Colitis	970 (6.1%)	36,715 (1.3%)	<0.001	960 (6.1%)	958 (6.1%)	0.962

Table 2: One-Year Risk of Fracture and Mortality in Pediatric Patients With Versus Without Malnutrition

Outcome	Malnutrition n (%)	No Malnutrition n (%)	Hazard Ratio (95% CI)
Overall Fracture	521 (3.1%)	320 (1.9%)	1.625 (1.414–1.867)
Hand or Wrist Fracture	29 (0.2%)	44 (0.3%)	0.626 (0.407–0.961)
Forearm Fracture	85 (0.5%)	109 (0.7%)	0.772 (0.582–1.026)
Upper Limb Fracture	121 (0.7%)	75 (0.4%)	1.603 (1.202–2.138)
Femur Fracture	138 (0.8%)	30 (0.2%)	4.572 (3.081–6.786)
Lower Leg Fracture	99 (0.6%)	51 (0.3%)	1.928 (1.375–2.702)
All-Cause Mortality	521 (3.1%)	35 (0.2%)	14.793 (10.505–20.830)

Table 3: Five-Year Risk of Fracture and Mortality in Pediatric Patients With Versus Without Malnutrition

Outcome	Malnutrition n (%)	No Malnutrition n (%)	Hazard Ratio (95% CI)
Overall Fracture	1,156 (7.3%)	945 (6.0%)	1.257 (1.153–1.370)
Hand or Wrist Fracture	150 (1.0%)	200 (1.3%)	0.730 (0.595–0.896)
Forearm Fracture	265 (1.7%)	314 (2.0%)	0.857 (0.728–1.009)
Upper Limb Fracture	241 (1.5%)	207 (1.3%)	1.184 (0.984–1.426)
Femur Fracture	222 (1.4%)	56 (0.4%)	4.019 (2.998–5.388)
Lower Leg Fracture	240 (1.5%)	176 (1.1%)	1.388 (1.143–1.687)
All-Cause Mortality	867 (5.5%)	112 (0.7%)	7.841 (6.440–9.546)