Indicators of Nutritional Status Predict Neuropsychiatric Symptoms in Dementia

The Cache County Dementia Progression Study

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Abstract

Background. Neuropsychiatric symptoms (NPS) are common in dementia and are associated with worse patient outcomes and caregiver stress. Persons with dementia are also at greater risk for malnutrition. Using a population-based sample, we examined the association between indicators of nutritional status and course of NPS in dementia.

Methods. 257 individuals with dementia (72% Alzheimer's disease, 54% female) were followed annually for up to 6.5 years. Mean(SD) age was 86(5.35). Nutritional status was assessed using a modified Mini-Nutritional Assessment (mMNA) and NPS via the 12-domain Neuropsychiatric Inventory (NPI-12). Cluster scores were calculated by summing domains for depression, anxiety and irritability (Affective) and hallucinations and delusions (Psychosis); Agitation and Apathy were single domains. Linear mixed models tested the association between nutritional status (mMNA total score or clinical groups of malnourished, risk for malnutrition, and well-nourished, 13%, 37% and 50% at baseline, respectively), and total NPI-12 score and the four symptom clusters. Also examined were mMNA component scores as predictors of total NPI. Covariates tested included demographics, place of residence, dementia type, age of dementia onset and duration, caregiver co-residency and APOE genotype.

Results. Total NPI-12 scores increased over time (1.3 points/year). In multivariable models, higher mMNA score was associated with lower total NPI-12 score (B=-1.2; SE=.15). Malnourished persons (B=8.10; SE=1.37) and those at risk for malnutrition (B=3.09; SE=0.91) had worse NPS-12 scores compared to well-nourished participants. Higher mMNA scores were associated with lower Affective (B=-.09; SE=.05), Psychosis (B=-.09; SE=0.04), and Apathy (B=-.19; SE=0.05) cluster scores. MMNA components associated with greater NPS were a decline in food intake (B=2.35; SE=.51), some weight loss (B=7.36; SE=1.24), being bed/chair bound (B=6.64; SE=1.59), limited mobility (B=2.68; SE=.99) and lower dairy intake (B=2.63; SE=1.65), though over time, higher dairy intake was associated with increasing NPS (B=1.82; SE=.89).

Conclusions. Nutritional status is associated with NPS in dementia. A decline in food intake, weight loss and limited mobility are risk factors and may signal the need for intervention. Addressing nutritional deficiencies may reduce the occurrence and severity of NPS.

Introduction

- Malnutrition is characterized by poor appetite, insufficient caloric intake, weight loss and low muscle mass and is a recognized problem among older adults and in persons with dementia[1].
- Nutritional status declines over the course of dementia[1] and poorer nutritional status is associated with cognitive[2,3] and functional decline[3,4], and the occurrence of neuropsychiatric symptoms (NPS)[3,5].
- The majority of studies to date have examined nutritional status and dementia progression in clinical samples with limited follow-up times.
- We examined the association between indicators of nutritional status and neuropsychiatric symptoms in a population based sample of persons with dementia.

Methods

Participants:

- Persons with incident dementia diagnosed in the Cache County Memory Study[6] were enrolled in the Dementia Progression Study[7] (DPS), a population-based study of the course of dementia and modifying factors.

Procedures:

- DPS researchers visited participants and caregivers approximately every 6 months, collecting information on neuropsychiatric symptoms (NPS), and cognitive and functional status. Nutritional status was assessed annually and data from these visits were used for up to 7 years from baseline.

Measures:

Nutritional status

- Modified Mini Nutritional Assessment (mMNA) was adapted from the Mini Nutritional Assessment[8] (MNA), a well-established assessment of nutritional status in older adults.
- mMNA excluded items associated with severity of dementia (presence of severe dementia), neuropsychiatric status (e.g., depression) and subjective report of nutritional status. New threshold values (22 pt max): <12.5=malnourished, 13-17.5= risk for malnutrition, ≥17.5=well-nourished.

Neuropsychiatric status

- Neuropsychiatric inventory (NPI) assessed hallucinations, delusions, anxiety, depression, apathy, agitation/aggression, irritability, aberrant motor behavior, disinhibition, euphoria, sleep and appetite. Max total = 144 pts.
- NPS cluster scores: Affective (sum of depression, anxiety and irritability for max 36 pts); Psychosis (sum of hallucinations and delusions for max 24 pts); Agitation (max 12 pts), and Apathy (max 12 pts).

Statistical Modeling:

- Linear mixed models (random intercepts and slopes) tested the following:
  - Total mMNA score or clinical groups of malnourished, risk for malnutrition, and well-nourished and total NPI-12 score.
  - mMNA component scores and total NPI-12 score.

Covariates: demographics, place of residence, dementia type, age of dementia onset and duration, caregiver co-residence, and APOE genotype.

Results

Sample Characteristics:

- 257 persons with dementia (72% AD) with mean (sd) age of 86.0 (5.4), education of 13.3 (3.0) yrs. Baseline characteristics are below.

	Males (118)	Females (139)	Total (257)
Dementia Duration (M, SD)	2.97 (1.52)	3.87 (2.09)**	3.46 (1.90)
mMNA Total Score (M, SD)	17.29 (2.69)	15.90 (3.04**	16.54 (2.96)
mMNA Groups (N, %)			
Malnourished	11 (9)	23 (17)**	34 (13)
At-risk for Malnutrition	31 (26)	63 (45)**	94 (37)
Well-nourished	76 (65)	53 (38)**	129 (50)
Clinical Dementia Rating[1] (M, SD)	1.21 (0.52)	1.42 (0.66)*	1.32 (0.61)
Mini-Mental State Exam (M, SD)	21.35 (5.99)	19.76 (7.41)	20.50 (6.82)
NPI Total Score (M, SD)	10.48 (11.47)	12.92 (10.85)	11.77 (11.19)
NPI "Cluster" Scores (M, SD)			
Psychosis (max pts = 24)	1.04 (2.84)	1.56 (3.04)	1.33 (2.96)
Affective (max pts = 36)	2.72 (3.75)	3.78 (4.19)*	3.30 (4.02)
Agitation/Aggr (max pts = 12)	0.69 (1.87)	0.83 (1.76)	0.77 (1.81)
Apathy (max pts = 12)	2.03 (3.27)	2.31 (3.34)	2.18 (3.31)

- Higher mMNA was associated with lower total NPI-12 (B=-1.2; SE = .15). The Malnourished (B=8.10; SE=1.37) and those at risk for malnutrition (B=3.09; SE = 0.91) had worse NPS versus the well-nourished. There was no effect on rate of change in NPS.
- Higher mMNA scores were associated with lower Affective (B=-.09; SE = .05), Psychosis (B=-.-9; SE = 0.04) and Apathy (B=-.19; SE = .05) scores. There was no effect on rate of change in NPS clusters.
- Decline in food intake (B=2.35; SE = .51), weight loss (B=7.36; SE = 1.24), bed/chair bound (B=6.64; SE = 1.59), limited mobility (B=-2.68; SE = .99) and lower dairy intake (B=2.63, SE = .1.65) were associated with higher NPS.
- Over time, higher dairy intake (B=1.82; SE=.89) was associated with worse NPS.

MMNA Predicts Neuropsychiatric Symptoms and Symptom Clusters:

Figure 1 - Neuropsychiatric Symptoms

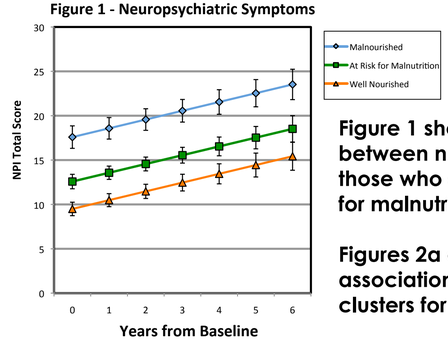


Figure 1 shows the association between nutritional status and NPS for those who are well-nourished, at risk for malnutrition and malnourished.

Figures 2a and 2b display a similar association for specific NPS symptom clusters for selected mMNA scores.

Figure 2a - Psychosis

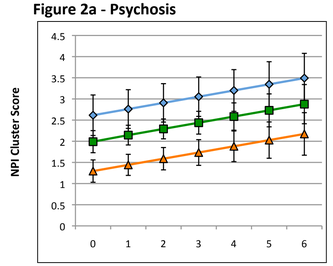
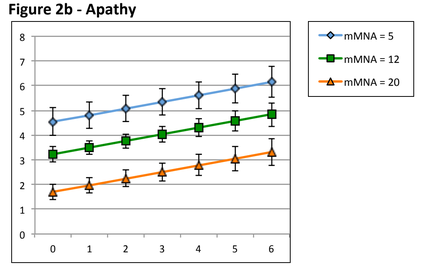


Figure 2b - Apathy



Years from Baseline

Conclusions

- We extend prior work demonstrating the association of nutritional status in the progression of cognitive and functional impairment in dementia, but now in predicting more severe NPS and affective, psychotic and apathy symptom clusters; results were robust to controlling for dementia onset, duration, caregiver co-residence and APOE genotype.
- Decline in food intake, weight loss and mobility should be monitored over the course of dementia and may signal the need for intervention.
- The results identify a potentially important modifiable factor that may reduce the occurrence and severity of NPS.

Citations

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