# AGE, NUTRITION AND HEMODIALYSIS

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***Objective***

Incidence of elderly receiving hemodialysis (HD) is increasing. Mortality co-morbidities and malnutrition are main burdens. We evaluated the presence of elderly in HD, survival rate, nutritional status and possible correlations with survival.

***Patients – Methods***

We evaluated 69 patients who were initiated HD at >70 years, on HD >2 months between 1.1.2009-1.9.2013. They were divided in 3 groups: > 70, >80 and >90 years old and compared according to survival (Kaplan-Meier) and nutrition (Geriatric Nutritional Risk Index-GNRI). Also investigated correlations with depression, QOL, dialysis dose and clinic-laboratory parameters by applying Geriatric Depression Scale, BDI, SF-36, Kt/V and co-morbidity-CCI.

***Results***

69 patients (70.4% of all incident patients) aged <70 started HD in the observed period. (Median age 82 ± 5 years, 60.9% males. 40 (58%) deceased after 28±27 months on HD, median age (M.A) while initiation HD 81±5 years and M.A of death 83±4. Main cause of death: myocardial infarct.

| | Males | Females | Total |
|---|---|---|---|
| Age | 77.3±6.5 | 76.7±7.7 | 77.3±7.2 |
| Diabetics | 17.2% | 17.2% | 34.4% |

*Table 1: Patient characteristics*

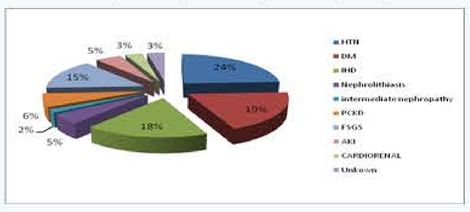



*Fig 1: Etiology of kidney disease*

| HD Modality | Patients | Duration in months |
|---|---|---|
| HD | 37 (59.7%) | 34±39 |
| HDF | 15 (24.2%) | 72±32 |
| On-line HDF | 10 (16.1%) | 50±34 |

*Table 2: Hemodialysis (HD) Modalities and Dialysis Vintage*

| Age group | 70-79 | 80-89 | 90-99 | Total |
|---|---|---|---|---|
| N (%) | 28 (41%) | 38 (55%) | 3 (4%) | 69 (100%) |
| Median time in HD | 31±34 | 27±23 | 13±12 | 28±27 |
| Median age of initiation HD | 77±2 | 83±3 | 93±3 | 81±5 |
| Median age of death | 80±2 | 86±3 | 94±4 | 83±4 |

*Table 3: Demographic of elderly patients who deceased.*

29 (42%) are alive, M.A 84±5, 52% males, 41% diabetics. 43±38 months on HD. M.A on initiation HD 81±6 years. 45% have AVF and 52% catheter. Main renal diseases: arterial hypertension (34 %) and diabetic nephropathy (21%). 6.4% receive two HD sessions weekly.

| | Men | Women | Total |
|---|---|---|---|
| N (%) | 15 (52%) | 14 (48%) | 29 (100%) |
| Age | 84±5 | 84±6 | 84±5 |
| Diabetics N (%) | 6 (21%) | 6 (21%) | 12 (42%) |
| Months in HD | 45±37 | 45±41 | 45±38 |
| Hemoblobin (%) | 34±2.5 | 35.1±2.3 | 34.5±2.4 |
| Albumin (g/dl) | 3.9±0.3 | 3.9±0.3 | 3.9±0.3 |

*Table 4: Demographic of elderly patients who are still alive.*

| | AVF | Central catheter (CL) | AVG |
|---|---|---|---|
| 70-79 | 4 (13,8%) | 9 (31,2%) | 1 (3%) |
| 80-89 | 9 (31,2%) | 4 (13,8%) | |
| 90-99 | | 2 (7%) | |
| Total | 13 (45%) | 15 (52%) | 1 (3%) |

*Table 5: Type of vascular access in each age group*

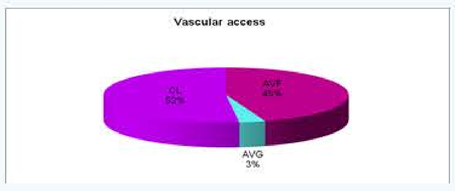



*Fig 2: Type of vascular access.*

| Age in years | Number of patients | Median age | Median time in HD (mo) | Median age of initiation HD |
|---|---|---|---|---|
| 70-79 | 6 | 79±0 | 26±30 | 77±3 |
| 80-89 | 18 | 83±2 | 45±42 | 79±4 |
| 90-99 | 5 | 94±2 | 53±33 | 90±4 |

*Table 6: Total results of old patients being still alive. The patients were dividide into 3 age groups.*

Statistical significance was found between age groups and dialysis modality, since patients >80 years were mostly on conventional HD, whereas patients <80 on HD, HDF and on line. More AVFs were reported in 90 years) 40 %. Expected survival 26.3% for the 2nd year, 5.3% for the 3rd, 21.1% for the 4th and 47.4% for the 5th year. No correlation found with sex, creatinin entering HD, osteodystrophy, anemia, ESRD causes, vascular access, cardiovascular disease, HD shift, diabetes, CCI, COPD and smoking.

| Elderly patients -divided in groups according to their initiation HD age | | | | | |
|---|---|---|---|---|---|
| | Total (n= 29) | 70-79 (n = 14) | 80-89 (n=13) | 90-99 (n=2) | P value |
| Gender (N) | | | | | |
| Male | 15 | 7 | 8 | 0 | 0,290 |
| Female | 14 | 7 | 5 | 2 | |
| Creatinin of initiation HD (M.O±sd) | 5,13±1,77 | 5,29±1,75 | 5,16±1,81 | 3,90±2,40 | 0,600 |
| Diastolic dysfunction (N ) | 12 | 7 | 4 | 1 | 0,713 |
| Causes of ESRD (N) | | | | | |
| HTN | 10 | 6 | 3 | 1 | 0,118 |
| DN | 6 | 3 | 3 | 1 | |
| GN | 4 | 2 | 2 | | |
| AKI | 3 | 1 | 2 | | |
| Cardiorenal | 2 | 1 | 1 | | |
| Unknown | 4 | 2 | 1 | | |
| Vascular access (N) | | | | | |
| CL | 15 | 9 | 4 | 2 | 0,241 |
| AVF | 13 | 4 | 9 | | |
| AVG | 1 | 1 | | | |
| Dialysis modality (N) | 21 | 7 | 12 | 2 | 0,019* between 70-79 and 80-89 |
| HD | 3 | 2 | 1 | | |
| HDF | 5 | 5 | | | |
| OL | | | | | |
| Cardiologic diseases (N) | 10 | 5 | 4 | 1 | 0,697 |
| HTN | 1 | 1 | 2 | | |
| Cardiac failure | 3 | 1 | 1 | | |
| Valvular dis | 1 | 1 | 1 | | |
| AF | 2 | | | | |
| IHD | | | | | |
| HTN (N) | 23 | 11 | 10 | 2 | 0,772 |
| CVD (N) | 5 | 2 | 3 | 0 | 0,691 |
| AF (N) | 7 | 2 | 5 | 0 | 0,263 |
| Peripheral vascular disease (N) | 9 | 6 | 3 | 0 | 0,359 |
| DM (N) | 12 | 5 | 6 | 1 | 0,847 |
| CCI (M.O.±sd) | 8,38±1,74 | 8±1,71 | 8,85±1,82 | 8±1,41 | 0,444 |
| COPD (N) | 4 | 3 | 1 | 0 | 0,522 |
| Dialysis shifts (N) | | | | | |
| 1 | 15 | 8 | 6 | 1 | 0,758 |
| 2 | 10 | 2 | 7 | 1 | |
| 3 | 4 | 4 | | | |
| Smokers (N) | 13 | 7 | 6 | 0 | 0,336 |
| Laboratory (M.O±sd) | | | | | |
| HCT | 34,52±2,43 | 33,83±2,11 | 35,52±2,56 | 32,90±1,81 | 0,118 |
| Na | 136,79±1,93 | 136,31±1,96 | 137,27±1,92 | 136,95±2,05 | 0,465 |
| PTH | 278,25±247,25 | 274,23±194,53 | 286,46±327,50 | 259,30±3,82 | 0,988 |
| Ca | 9,06±0,51 | 9,18±0,55 | 8,94±0,44 | 8,95±0,68 | 0,474 |
| Ph | 4,81±1,19 | 4,79±0,85 | 4,86±1,51 | 4,61±1,62 | 0,964 |
| CaxPh | 43,56±11,17 | 43,81±6,96 | 43,57±14,56 | 41,83±11,17 | 0,975 |
| Albumin | 3,88±0,31 | 3,92±0,37 | 3,83±0,21 | 3,90±0,42 | 0,758 |

*Table 7: Statistical significant correlation was found between the age groups and the dialysis modality. Patients over 80 years old are on conventional HD, whereas patients under 80 years old are on HD, HDF and on line.*

| Years | Survival rates | Died |
|---|---|---|
| 1,00 | 40,0% | 60,0% |
| 2,00 | 50,0% | 50,0% |
| 3,00 | 14,3% | 85,7% |
| 4,00 | 40,0% | 60,0% |
| 5+ | 52,9% | 47,1% |

*Table 8: 1-,2-,3- , 4-and 5- year survival rates were 40 %, 50 %, 14 %, 40 % and 52.9 % respectively.*

| Causes of death | N (%) |
|---|---|
| Ischemic heart disease, myocardial infarct | 14 (35%) |
| Cerebral vascular event | 8 (20%) |
| Cardiac arrest | 7 (17,5%) |
| Cardiac failure | 5 (12,5%) |
| Cachexie | 3 (7,5%) |
| Malignancy | 3 (7,5%) |

*Table 9: Causes of death*

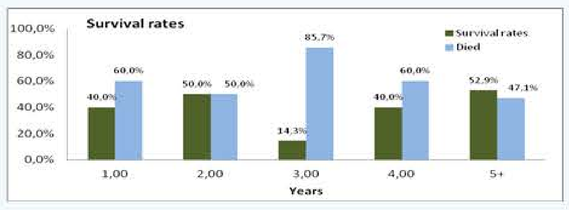



*Fig 3: In the observed period 58 % of patients died, median survival was 37 months. 1-,2-,3- , 4-and 5- year survival rates were 40 %, 50 %, 14 %, 40 % and 52.9 % respectively.*

| Age | Years | Survival rates | Died |
|---|---|---|---|
| 70-79 | 1,00 | 33,3% | 66,7% |
| | 2,00 | 66,7% | 33,3% |
| | 3,00 | 0,0% | 100,0% |
| | 4,00 | 40,0% | 60,0% |
| | 5+ | 62,5% | 37,5% |
| | Total | 46,7% | 53,3% |
| 80-89 | 1,00 | 46,2% | 53,8% |
| | 2,00 | 33,3% | 66,7% |
| | 3,00 | 20,0% | 80,0% |
| | 4,00 | 25,0% | 75,0% |
| | 5+ | 44,4% | 55,6% |
| | Total | 38,2% | 61,8% |
| 90+ | 1,00 | 33,3% | 66,7% |
| | 2,00 | 0,0% | 100,0% |
| | 4,00 | 100,0% | 0,0% |
| | Total | 40,0% | 60,0% |

*Table 10: Survival in each age group, per year*

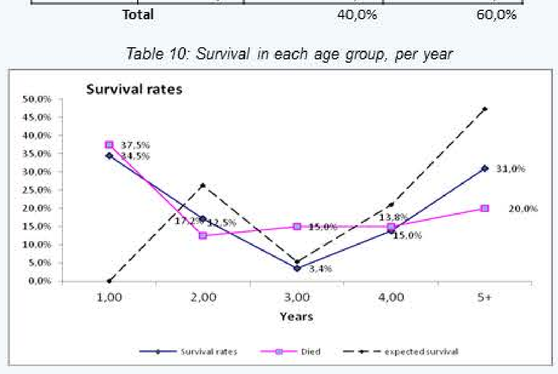



*Fig 7: The 5 year survival and expected survival rate.*

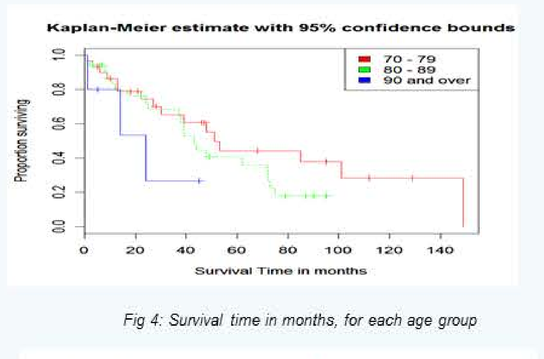



*Fig 4: Survival time in months, for each age group*

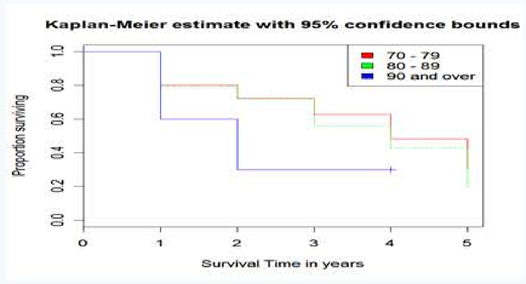



*Fig 5: Survival time in years, for each age group*




*Fig 6: Survival time in years for elderly > 90 years old and for elderly <90 years old.*

| Years | Survival rates | Died | expected survival |
|---|---|---|---|
| 1,00 | 34,5% | 37,5% | |
| 2,00 | 17,2% | 12,5% | 26,3% |
| 3,00 | 3,4% | 15,0% | 5,3% |
| 4,00 | 13,8% | 15,0% | 21,1% |
| 5+ | 31,0% | 20,0% | 47,4% |
| | 100,0% | 100,0% | 100,0% |

*Table 11: The expected survival has been estimated using 10 patients who were initiated HD in 2013 (they are all alive). By taking into consideration these 10 patients behavior during the next years, and by using as a coefficient the survival rate of each year, we prepared a perspective of the picture that will be formatted during the next years, according to our sample.*

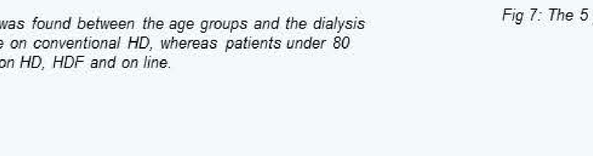



*Fig 8: The 5 year and over survival rate was 52.9%.*

Most elderly HD patients preserved good nutrition. 8.3 % had low and 4.7% moderate GNRI. Increasing age correlated with lower GNRI values, since mean GNRI for 70-79 years old was 108.2±10.7and for >80 years old 112.2 ±12.9. Statistical difference observed among nutrition, gender and ESRD cause, with females having higher GNRI scores and AKI and FSGN may predispose poorer nutrition. Peripheral vascular disease, diabetes and COPD patients were better nourished. Higher PTH levels, lower hematocrit (Hct) and QOL parameters regarding bodily pain, vitality and mental health related to moderate GNRI. No statistical difference was found with depression (BDI, GDS), cardiac disease, CCI, mortality and kt/v.

| N=57 | GNRI | | | |
|---|---|---|---|---|
| | absent | low | moderate | p value |
| Geriatric (N%) | | | | |
| Normal | 21 (36.8%) | 2 (3.5%) | 0 | p = 0.590 |
| Mild | 21 (36.8%) | 1 (1.9%) | 2 (3.5%) | not significant |
| Severely | 8 (14%) | 2 (3.5%) | 0 | |

*Table 12: Correlation Geriatric Depression Scale with GNRI*

| N=23 | GNRI (Women) | |
|---|---|---|
| | absent | low |
| Geriatric (N%) | | |
| Normal | 9 (39.1%) | 0 |
| Mild | 10 (43.5%) | 1 (4.4%) |
| Severely | 3 (13%) | 0 |

*Table 13: Correlation Geriatric Depression Scale with GNRI for women*

| N=34 | GNRI (Men) | | | |
|---|---|---|---|---|
| | absent | low | moderate | p value |
| Geriatric (N%) | | | | |
| Normal | 12 (%) | 2 (%) | 0 | p = 0.655 |
| Mild | 11(%) | 0 (%) | 2 (%) | not significant |
| Severely | 5(%) | 2 (%) | 0 | |

*Table 14: Correlation Geriatric Depression Scale with GNRI for men*

| N=60 | GNRI | | | |
|---|---|---|---|---|
| | absent | low | moderate | p value |
| BDI (N%) | | | | |
| low | 26 (43.3%) | 3(5%) | 3(5%) | p = 0.439 |
| moderate | 19 (31.7%) | 1(1.7%) | | not significant |
| high | 7(11.7%) | 1(1.7%) | | |

*Table 15: Correlation BDI with GNRI*

In our results, there was statistical difference observed between the three nutritional groups and PR, BP, VT, RE and MH. There was correlation found between QOL and nutritional status, according to the GNRI and SF-36 recordings. Interestingly, patients with poorer nutritional status, stated a better QOL.There was statistical difference observed between the lower GNRI and absent / moderate scores in bodily pain (BP, p=0.013 and p=0.008 with absent and moderate GNRI scores respectively), vitality (VT, p=0.036) and Mental health (MH, p=0,003). Patients with moderate nutritional state present with lower hematocrit levels. There was no correlation found between hematocrit and nutritional status, according to the GNRI recordings.

| | GNRI | | | p value |
|---|---|---|---|---|
| | absent | low | moderate | |
| SF36 (mean±sd) | | | | |
| PF | 32.2±14.1 | 29.4±9.0 | 34.1±26.7 | Ns |
| RP | 34.4±10.2 | 36.8±13.3 | 28.0±0.0 | 0,001 low and absent |
| BP | 42.2±15.6 | 57.6±6.1 | 29.3±0.0 | 0,013 Low and absent 0,000 absent and moderate 0,008 Low and moderate |
| GH | 33.9±9.7 | 39.5±10.2 | 31.3±3.3 | Ns |
| VT | 42.3±13.1 | 47.9±5.6 | 32.5±0.0 | 0,000 Absent and moderate 0,036 Low and moderate |
| SF | 35.0±13.8 | 42.2±13.5 | 27.3±3.8 | Ns |
| RE | 29.2±11.5 | 29.0±10.6 | 23.7±0.0 | 0,010 Absent and moderate |
| MH | 38.0±15.9 | 47.6±2,2 | 30.9±5.2 | 0,003 Absent kai low |
| PCS | 34.2±10.0 | 38.2±3.9 | 30.3±13.8 | Ns |
| MCS | 37.5±13.4 | 44.0±6.9 | 28.9±10.0 | Ns |







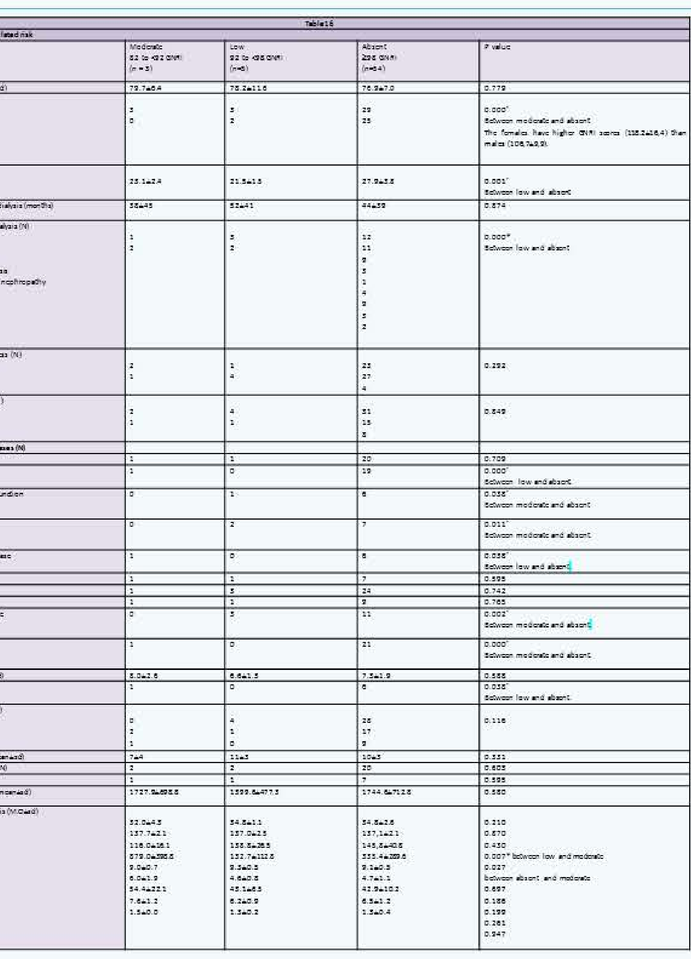



| | GNRI | | |
|---|---|---|---|
| | absent | low | moderate |
| Hct % (mean±sd) | 34,8±2,6 | 34,8±1,1 | 32,0±4,3 |

| | Mean ±sd | p value between 3 GNRI groups |
|---|---|---|
| Dry weight (kg) | 67.4±10.0 | 0.029 |
| CCI | 7.3±1.9 | p= 0.448 not significant |
| kt/v | 1.4±0.3 | p= 0.947 not significant |

| | N (%) |
|---|---|
| Alb < 37g/l | 6 (9.7%) |
| BMI < 23kg/m² | 7 (11.3%) |
| BDI > cut off | 31 (51.7%) |
| GDS > cut off | 34 (59.6%) |
| DM | 22 (34.4%) |

| | GDS | | Hct | | Age | |
|---|---|---|---|---|---|---|
| | <cut off | >cut off | >38% | <32% | >70 | <70 |
| GNRI | | | | | | |
| Absent | 21 (36.8%) | 29 (50.9%) | 5 (8.1%) | 5 (8.1%) | 39 (62.9%) | 11 (17.7%) |
| Low | 2 (3.5%) | 3 (5.3%) | 0 | 0 | 3 (4.8%) | 2 (3.2%) |
| moderate | | 2 (3.5%) | 0 | 2 (3.2%) | 2 (3.2%) | 0 |




*Conclusions*

Elderly patients represented the majority of our patients. Initiation HD in older age (>80) is not contradictive, as there was no big difference in survival curves of the 3 age groups. Survival rate in 90 years old was similar to octogenarians. Mortality rate increased in the first 3 years. Prevalence of co-morbidities was similar with aging. GNRI is a simple tool for predicting malnutrition risk. Deteriorated nutrition correlates with QOL, increasing age, PTH and lower hct in elderly HD patients but not with depression or CCI.

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