

CHAPTER 8

Nutritional Status on Dialysis

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SECTION 8.1: SERUM ALBUMIN LEVELS ON DIALYSIS

Patient numbers increased by 1372 for HD in 2007. Mean serum albumin levels in 2007 was 39.7 g/L, which is just at the borderline for mortality risk (>40 g/L). However, the overall trend for percentage distribution of patients for serum albumin remained unchanged since 2003. The percent well-nourished patients (>40g/L) remained above 50% whilst 35% of patients were in the 35-40g/L range. Improving trends were also indicated from the cumulative distribution graph of albumin in HD patients (Figure 8.1.1)

Table 8.1.1: Distribution of serum albumin, HD patients, 1998- 2007

year	no of subjects	Mean	SD	Median	LQ	UQ	% patients <30g/L	% patients 30 - <35g/L	% patients 35-<40g/L	% patients ≥40g/L
1998	2075	41.2	6.5	41	37.5	44.7	3	9	28	59
1999	2755	39.7	6.1	39.7	36.3	43	4	13	35	49
2000	3733	38.6	7	39	36	42	5	11	41	43
2001	4666	39	5.6	38.5	36	41.8	3	15	44	38
2002	5568	39.2	5.6	39	36.5	42	3	12	42	43
2003	6523	39.9	5.4	40	37.3	42.5	3	9	35	52
2004	7580	39.9	5.3	40	37	42.8	3	10	34	53
2005	8706	40	5.2	40.3	37.5	42.8	3	9	33	56
2006	10928	39.8	5.4	40.3	37.3	42.8	3	10	33	54
2007	12300	39.7	5.3	40	37	42.5	3	10	35	52

Figure 8.1.1: Cumulative distribution of Albumin, HD patients 1998-2007

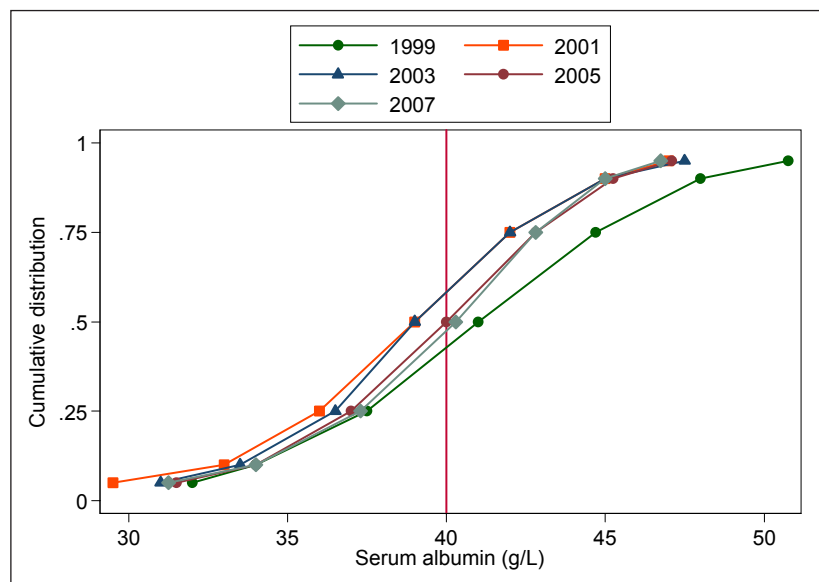
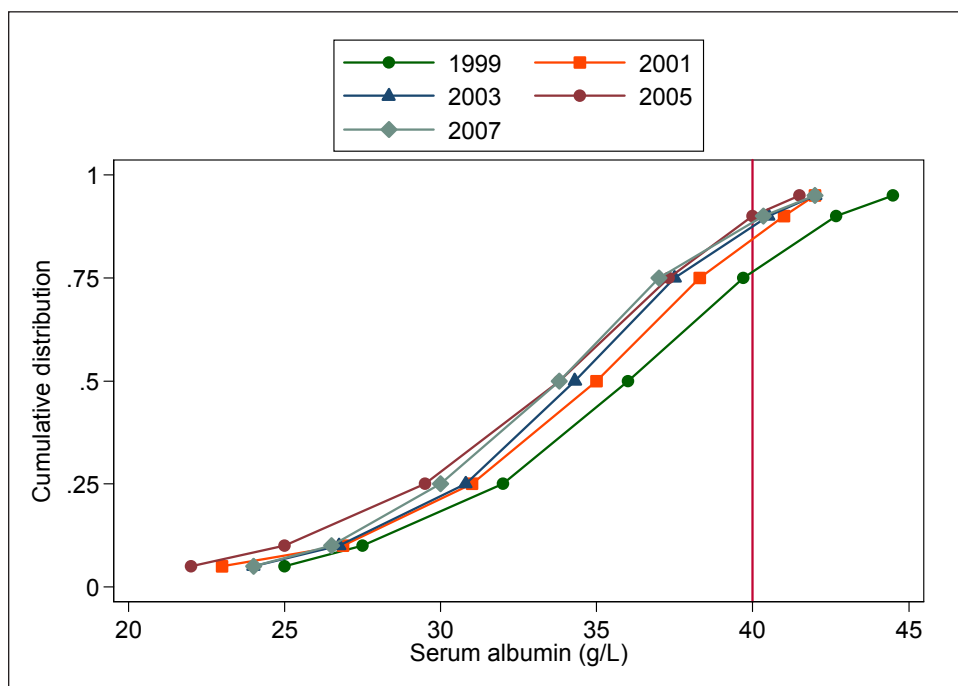


Table 8.1.2: Distribution of serum albumin, CAPD patients, 1998- 2007

year	No of subjects	Mean	SD	Median	LQ	UQ	% patients <30g/L	% patients 30 -≤35g/L	% patients 35-<40g/L	% patients ≥40g/L
1998	536	35.8	6.7	36	32	39.7	16	25	35	24
1999	597	34.1	6.6	34	30.8	38	21	33	32	14
2000	640	34.3	6.1	35	31	38.3	20	28	37	14
2001	750	33.3	6.2	33.6	29.3	37	27	33	28	12
2002	862	33.9	5.9	34.3	30.8	37.5	21	35	33	12
2003	1180	33.3	5.8	33.8	29.7	37.3	26	33	30	11
2004	1284	33	6	33.8	29.5	37.3	27	32	30	11
2005	1346	33.2	6.4	33.3	29.5	37	27	33	30	10
2006	1498	33.5	6.1	33.8	30	37	25	33	30	12
2007	1753	33.6	6.2	34	30	37.8	25	31	30	14

The downward trend in mean serum albumin levels for patients on CAPD decreased from 35.8 g/L in 1998 to 33.6g/L in 2007. Percentage of patients at increased mortality risk (<35 g/L) increased from 41% in 1998 to 56% by 2007. This was despite a 2% improvement in the number of patients with serum albumin >40g/L in 2007 compared to 2006. The cumulative distribution graph in 2007, reflects the trend that CAPD patients with serum albumin <35 g/L is increasing (Figure 8.1.2)

Figure 8.1.2: Cumulative distribution of Albumin, CAPD patients 1998-2007

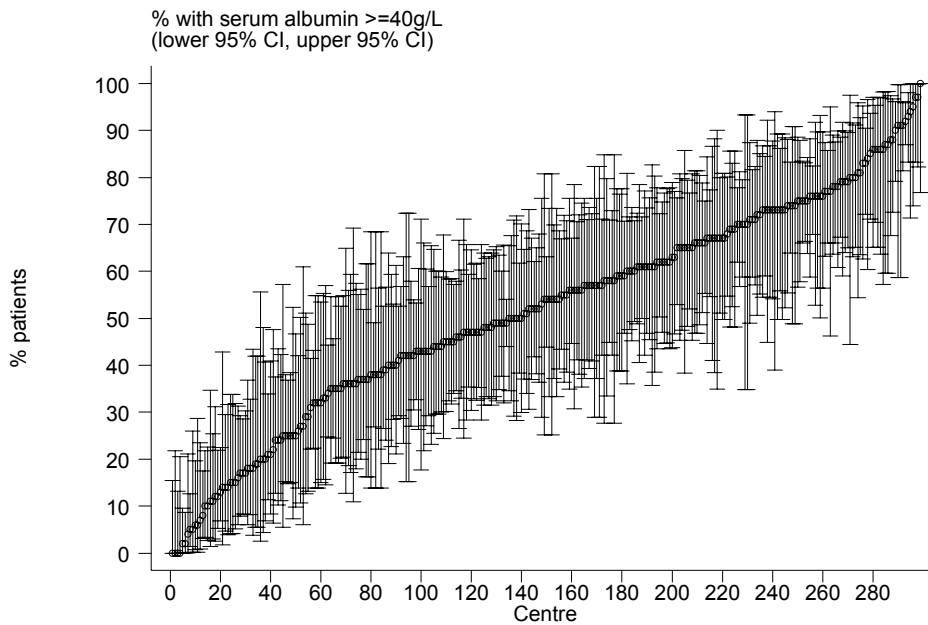


A wide variation between HD centers was observed for those achieving serum albumin $\geq 40\text{g/L}$ (target albumin) for 2007 as shown in figure 8.1.3. The median was 54% for the year 2007. The trend in the percent of HD centres achieving a median $>50\%$ since 2003 is therefore continuing. The best centre had all (100%) patients achieving serum albumin $\geq 40\text{g/L}$ (target albumin), whilst the worst center had zero patients achieving this target. For all HD centres, a greater than 8-fold variation in meeting albumin target was observed. (Table 8.1.3).

Table 8.1.3: Variation in Proportion of patients with serum albumin $\geq 40\text{g/L}$ among HD centres 2007

year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	49	7	16	31	54	78	95	96
1999	69	2	8	22	50	65	89	100
2000	94	0	6	25	43	62	83	93
2001	116	0	3	17	39.5	56.5	82	100
2002	141	0	9	26	44	62	83	100
2003	170	0	18	40	55	70	92	100
2004	198	0	10	35	57.5	73	90	100
2005	228	4	13	42	56	70	87	100
2006	279	0	9	36	53	70	87	100
2007	299	0	10	37	54	69	87	100

Figure 8.1.3: Variation in Proportion of patients with serum albumin $\geq 40\text{g/L}$, HD centres 2007



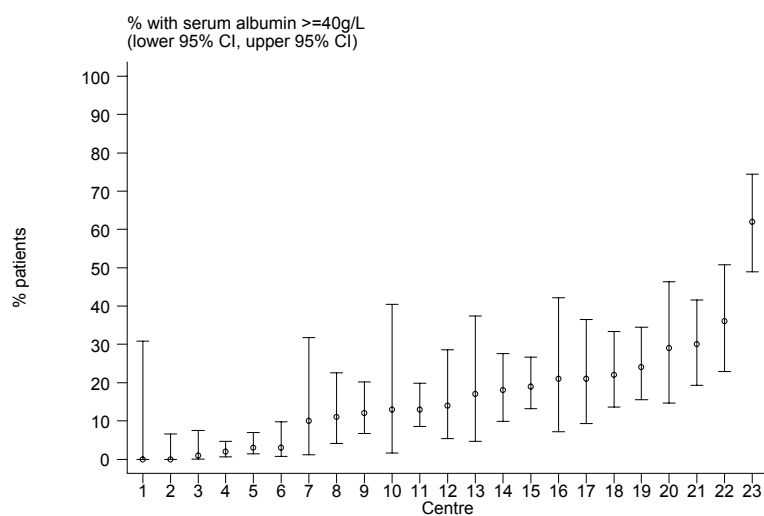
For 23 CAPD centers in 2007, one center reported the maximum proportion of patients achieving the target serum albumin $\geq 40\text{g/L}$ was 62% whilst majority of centers reported less than 40% of patients achieving this target. The maximum proportion of patients achieving the target serum albumin level of $\geq 40\text{g/L}$ has dropped by 10% compared to 2006.

Table 8.1.4: Variation in Proportion of patients with serum albumin $\geq 40\text{g/L}$ among CAPD centres 2007

year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	9	5	5	18	27	34	40	40
1999	10	2	2	8	14.5	18	29	29
2000	11	0	0	5	13	28	42	42
2001	12	1	1	4.5	16	27.5	36	36
2002	15	5	5	6	12	20	36	36
2003	19	1	1	9	14	19	58	58
2004	19	2	2	8	12	21	35	35
2005	20	0	0.5	6	11.5	23.5	28	29
2006	22	1	1	6	13	22	42	72
2007	23	0	0	3	14	22	36	62

There was wide variation amongst 23 CAPD centers reporting the proportion of patients achieving the target serum albumin $\geq 40\text{g/L}$ for the year 2007 as shown in figure 8.1.4.

Figure 8.1.4: Variation in Proportion of patients with serum albumin $\geq 40\text{g/L}$, CAPD centres 2007



SECTION 8.2: BODY MASS INDEX (BMI) ON DIALYSIS

Table 8.2.1 indicates the mean BMI for HD patients from 1998 to 2007. For the year 2007 the mean BMI was 23.5 ± 8.5 for a HD population of 10438. This indicates that overall mean BMI trend is stabilizing at 23 [22.9 in 2000 to 23.5 in 2007] despite a 3-fold increase in patient numbers from 2000 onwards. An increasing trend of improved BMI is observed for HD patients, with the percentage of HD patients with BMI ≥ 25 increasing from 21% in 1998 to 30% in 2007. This may perhaps reflect an increased number of overweight diabetic patients coming into dialysis, the longer period on dialysis or perhaps an improved dietary intake amongst patients. The percent number of patients with BMI <18.5 remained at 14%.

Table 8.2.1: Distribution of BMI, HD patients, 1998- 2007

year	n	Mean	SD	Median	LQ	UQ	% patients <18.5g/L	% patients 18.5-25g/L	% patients ≥ 25
1998	1980	24.1	18.3	21.6	19.1	24.3	19	60	21
1999	2710	23.5	15.9	21.4	19.2	24.4	18	61	21
2000	3858	22.9	11.7	21.6	19.3	24.5	18	60	22
2001	4549	23	11	21.9	19.3	24.7	18	59	23
2002	5100	23.2	10.6	22	19.5	24.9	16	59	24
2003	5984	23.1	9.7	22.1	19.5	25.1	16	58	26
2004	6767	23.3	9	22.4	19.8	25.4	14	58	28
2005	7830	23.4	9	22.5	19.8	25.6	14	57	29
2006	9767	23.3	7.9	22.6	19.9	25.7	14	56	29
2007	10438	23.5	8.5	22.7	19.9	25.8	14	56	30

Figure 8.2.1 reflects the increasing BMI trends as curve for 2007 continues in moving right. About 70% of the HD population are at BMI of 25.

Figure 8.2.1: Cumulative distribution of BMI, HD patients 1998-2007

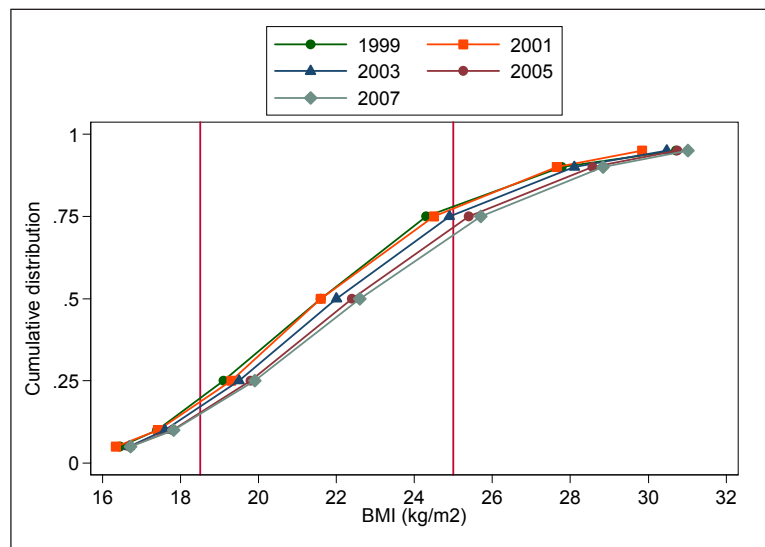
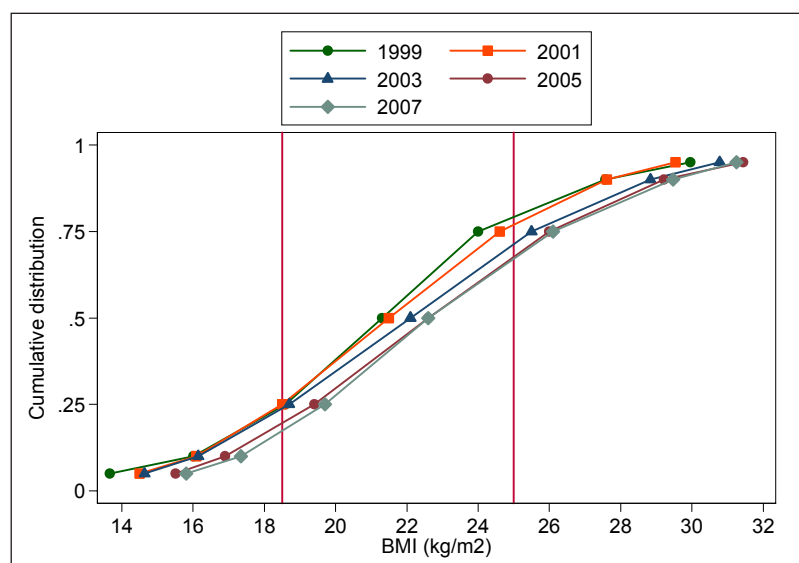


Table 8.2.2. indicates that mean BMI for CAPD patients from 1998 to 2007 is increasing from 22.0 to 23.5 despite a 3-fold increase in patient numbers. The percentage of CAPD patients with BMI ≥ 25 increased from 20% in 1998 to 35% in 2007. This may perhaps reflect an increased number of overweight diabetic patients coming into dialysis.

Table 8.2.2: Distribution of BMI, CAPD patients 1998-2007

year	n	Mean	SD	Median	LQ	UQ	% patients <18.5g/L	% patients 18.5-25g/L	% patients ≥ 25
1998	491	22	11.1	21.3	18.6	24	23	57	20
1999	552	21.7	4.5	21.5	18.8	24.4	23	56	22
2000	603	21.6	4.5	21.5	18.5	24.6	25	53	22
2001	665	22	5.1	21.7	18.7	25.2	24	50	26
2002	752	22.2	5	22.1	18.7	25.5	24	47	30
2003	1071	22.9	6.8	22.5	19.2	25.8	20	50	30
2004	1175	23.1	7.2	22.6	19.4	26	18	51	31
2005	1223	23	7.2	22.5	19.4	25.8	20	50	30
2006	1419	23.3	8.2	22.6	19.7	26.1	16	51	33
2007	1613	23.5	5.8	22.9	20	26.4	14	51	35

Figure 8.2.2: Cumulative distribution of BMI, CAPD patients 1998-2007



Less variation was observed for BMI measurements amongst 282 HD centers for 2007. The median of participating centres was 87%. The best centre had all (100%) patients achieving BMI ≥ 18.5 (target), while the worst center had 56% of patients achieving this target. For all HD centres, there was 1.4-fold variation in meeting target BMI (≥ 18.5). (Table 8.2.3).

Table 8.2.3: Variation in Proportion of patients with BMI ≥ 18.5 among HD centres 2007

year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	47	59	68	76	81	86	93	100
1999	70	57	62	78	82	90	94	100
2000	95	55	65	75	82	89	100	100
2001	111	60	68	77	83	89	94	100
2002	133	55	67	78	85	90	100	100
2003	156	60	70	79	84	91	100	100
2004	187	62	68	81	86	91	100	100
2005	206	64	70	81	88	93	100	100
2006	263	53	71	80	87	92	100	100
2007	282	56	70	82	87	92	100	100

Figure 8.2.3 indicates the variation amongst 282 HD centers reporting the proportion of patients achieving the target BMI ≥ 18.5 for the year 2007. The centre with the least achievement of this target recorded a percentage of 56%.

Figure 8.2.3: Variation in Proportion of patients with BMI ≥ 18.5 among HD centres 2007

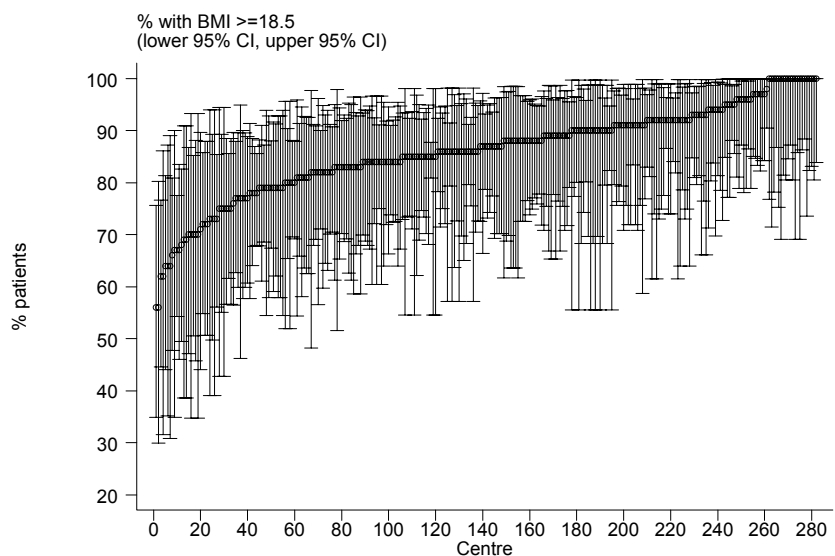


Table 8.2.4: Variation in Proportion of patients with BMI \geq 18.5 among CAPD centres 2007

year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	9	0	0	71	80	87	91	91
1999	9	0	0	71	75	83	92	92
2000	11	11	11	63	76	87	90	90
2001	11	15	15	72	77	88	92	92
2002	15	17	17	63	80	84	87	87
2003	19	17	17	63	81	87	96	96
2004	19	27	27	71	82	89	94	94
2005	18	32	32	69	84	87	91	91
2006	22	19	29	78	84.5	91	92	93
2007	22	18	32	76	87.5	92	97	100

For the 22 CAPD centers in 2007, the maximum proportion of patients achieving the target BMI \geq 18.5 was 100% whilst the worst centres reported 18% of the patients achieving this target. This represented a 5.5-fold difference in variation

Figure 8.2.4: Variation in Proportion of patients with BMI \geq 18.5 among CAPD centres 2007

Figure 8.2.4 indicates that only one center reported the lowest proportion of patients achieving the target BMI \geq 18.5 whilst 18 centers reported higher proportions ($>75\%$).

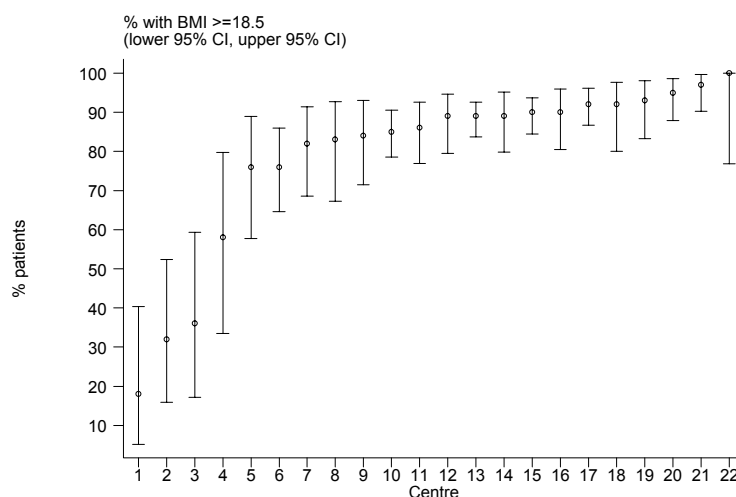


Table 8.2.5: Variation in Proportion of patients with BMI ≤ 18.5 and serum albumin ≤ 30 g/dL among HD centres 2007

Year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	47	0	0	0	0	1	6	8
1999	63	0	0	0	0	2	5	10
2000	85	0	0	0	0	1	9	28
2001	104	0	0	0	0	0	6	9
2002	123	0	0	0	0	0	5	13
2003	151	0	0	0	0	0	5	10
2004	180	0	0	0	0	0	4	9
2005	199	0	0	0	0	0	5	14
2006	251	0	0	0	0	0	8	36
2007	275	0	0	0	0	0	4	11

Table 8.2.5 & Figure 8.2.5 shows that 15 out of 274 HD centres (5.5%) reported patients with BMI of < 18.5 and serum albumin of <30 g/L with 4 of these centres (1.5%) at the 95th percentile. This shows a marked improvement compared to 2006 which reported 14% of the centers having a high proportion of severely malnourished patients.

Figure 8.2.5: Variation in Proportion of patients with BMI ≤ 18.5 and serum albumin ≤ 30 g/dL among HD centres 2007

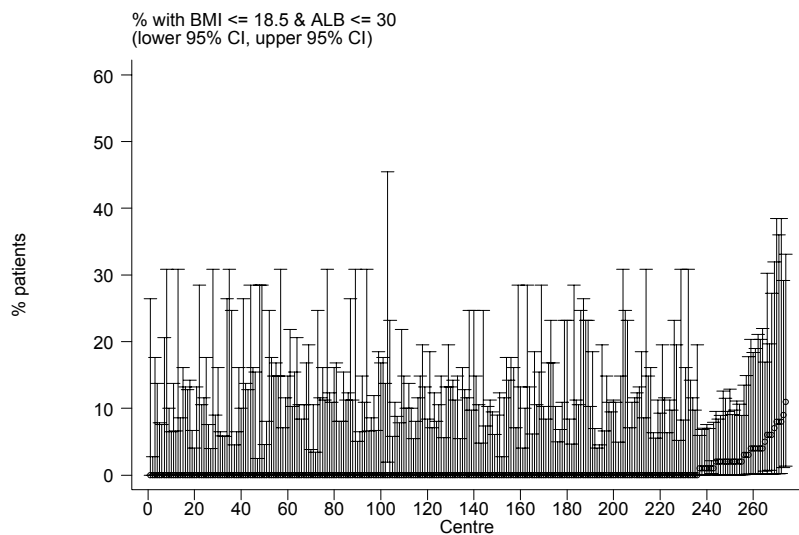


Table 8.2.6: Variation in Proportion of patients with BMI \leq 18.5 and serum albumin \leq 30 g/dL among CAPD centres 2007

year	No of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1998	9	0	0	0	0	3	5	5
1999	9	0	0	0	3	6	29	29
2000	11	0	0	2	5	8	12	12
2001	11	2	2	4	5	9	15	15
2002	15	0	0	0	3	7	20	20
2003	19	0	0	0	4	9	18	18
2004	19	0	0	0	3	6	10	10
2005	18	0	0	3	5	7	12	12
2006	22	0	0	2	4	6	12	27
2007	22	0	0	1	4	8	14	24

Table 8.2.6 & Figure 8.2.6 shows that 24% of patients in the 22 CAPD centers had low BMI of <18.5 and low serum albumin of <30 g/L with 14% of patients at the 95th percentile. This shows a slight improvement compared to 2006 where 27% of patients in 22 centers were reported to have a high proportion of severely malnourished patients.

Figure 8.2.6: Variation in Proportion of patients with BMI \leq 18.5 and serum albumin \leq 30 g/dL among CAPD centres 2007

