

CHAPTER 8

Nutritional Status on Dialysis

Tilakavati Karupaiah
Winnie Chee Siew Swee
Ahmad Fauzi Abdul Rahman

SECTION 8.1: SERUM ALBUMIN LEVELS ON DIALYSIS

Patient numbers increased by 2115 for HD in 2008. Mean serum albumin levels in 2008 was 39.4 g/L, which is just below the borderline for mortality risk (<40 g/L). Though the overall trend for percentage distribution of patients for serum albumin is similar since 2003 some changes are occurring in the distribution of patients in the quartiles above 35g/L. The percentage of well-nourished patients (≥ 40 g/L) was 50% whilst 36% of patients are in the 35-40g/L range. Compared to 2006, there is a 4% drop in patients above the safety margin based on Serum Albumin risk (≥ 40 g/L). This trend (2006 vs. 2008) is also reflected in the cumulative distribution graph of albumin in HD patients.

Table 8.1.1: Distribution of serum albumin, HD patients, 1999- 2008

year	No. of subjects	Mean	SD	Median	LQ	UQ	% patients <30g/L	% patients 30-<35g/L	% patients 35-<40g/L	% patients ≥ 40 g/L
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	6524	39.9	5.4	40	37.3	42.5	3	9	35	52
2004	7581	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	12315	39.7	5.3	40	37	42.5	3	10	35	52
2008	14430	39.4	5.1	40	37	42.3	3	10	36	50

Figure 8.1.1: Cumulative distribution of Albumin, HD patients 1999-2008

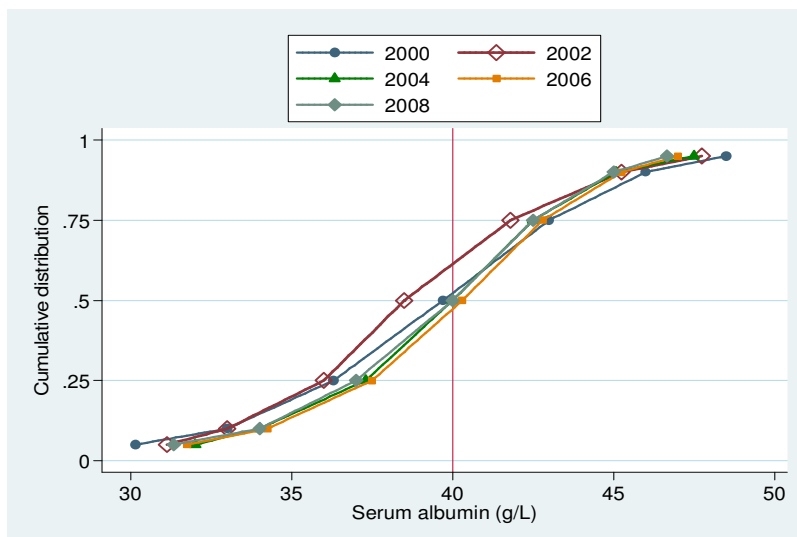
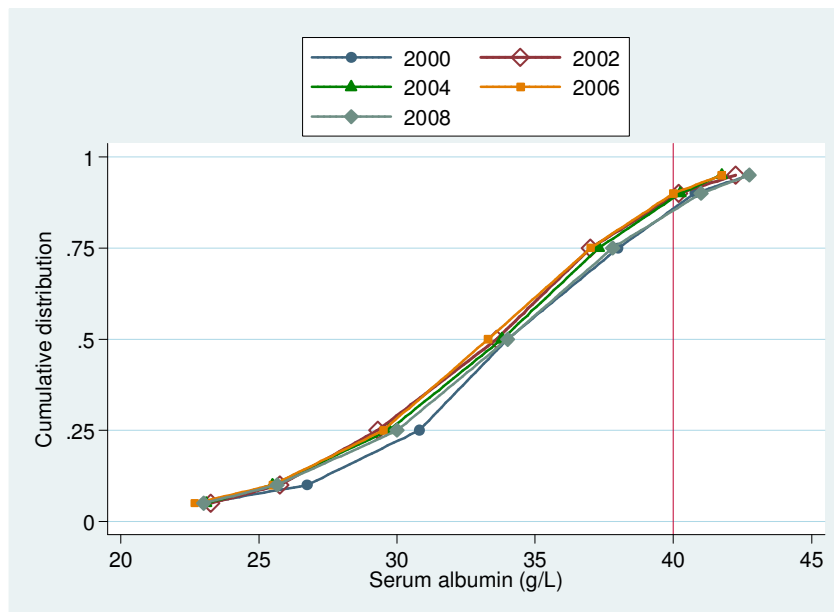


Table 8.1.2: Distribution of serum albumin, PD patients, 1999- 2008

year	No. of subjects	Mean	SD	Median	LQ	UQ	% patients <30g/L	% patients 30-<35g/L	% patients 35-<40g/L	% patients ≥40g/L
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
2008	2021	33.1	6.4	33.3	29.3	37.3	28	32	27	13

Figure 8.1.2: Cumulative distribution of Albumin, PD patients 1999-2008



The number of HD centres has almost doubled since 2003. A wide variation between HD centers was observed for those achieving serum albumin $\geq 40\text{g/L}$ (target albumin) for 2008. The median was 50% for the year 2008. The trend in the percent of HD centres achieving a median $>50\%$ is seen to be decreasing since 2003. 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, 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 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	68	4	7	22	50.5	65	91	100
2000	94	0	4	24	43	62	82	91
2001	117	0	3	17	40	56	82	100
2002	140	0	9	27	43.5	62.5	86.5	100
2003	170	0	18	40	54.5	70	92	100
2004	198	0	11	35	57	73	89	100
2005	226	4	13	43	56	69	86	100
2006	280	0	9.5	37	54	70.5	87.5	100
2007	305	0	11	36	54	69	88	100
2008	346	0	6	34	50	67	85	100

Figure 8.1.3 indicates the wide variation amongst 346 HD centers reporting the proportion of patients able to achieve the target serum albumin $\geq 40\text{g/L}$ for the year 2008.

Figure 8.1.3: Variation in Proportion of patients with serum albumin $\geq 40\text{g/L}$, HD centres 2008

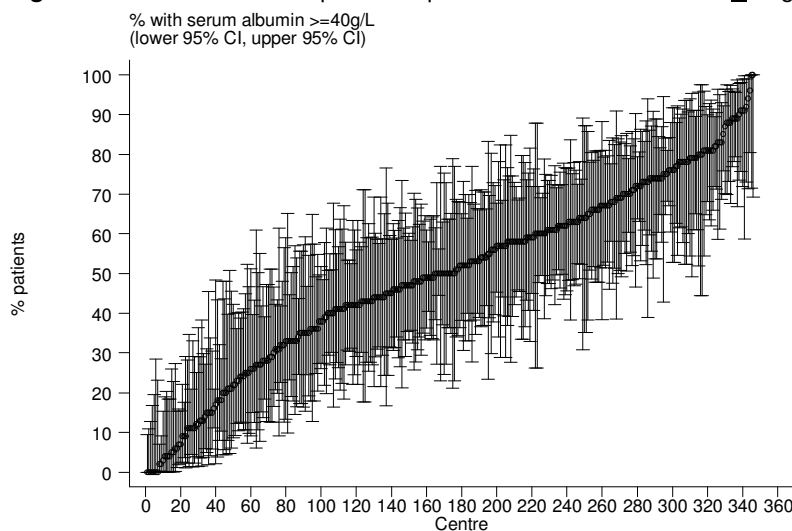
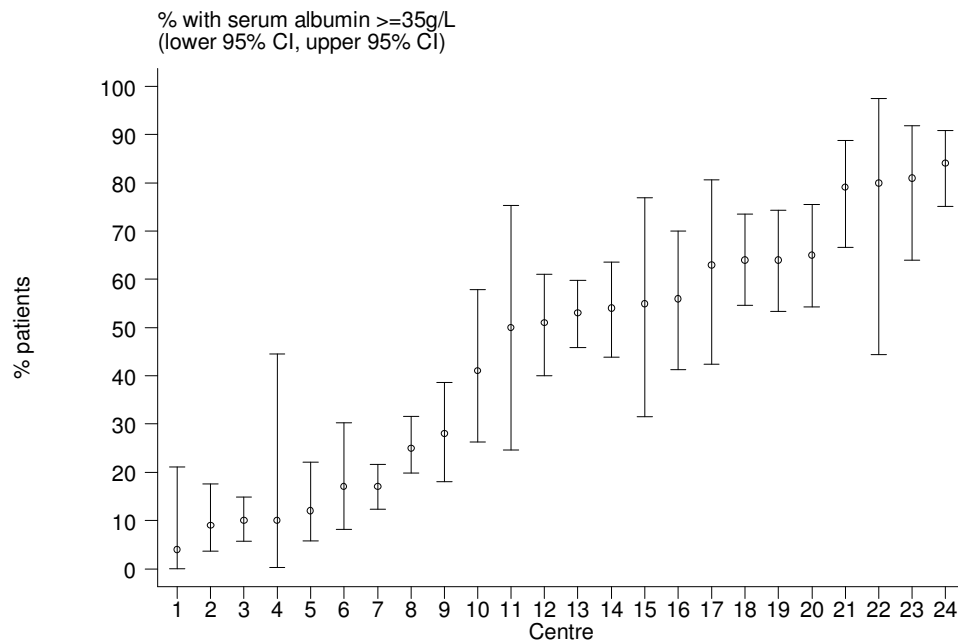


Table 8.1.4: Variation in Proportion of patients with serum albumin ≥ 35 g/L among PD centres 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	10	12	12	33	44.5	64	75	75
2000	11	10	10	36	55	73	83	83
2001	12	9	9	28.5	46	62	75	75
2002	15	17	17	36	58	67	70	70
2003	19	14	14	39	48	64	81	81
2004	19	11	11	49	58	65	81	81
2005	20	11	13.5	32.5	57	68	80.5	82
2006	22	12	15	38	53.5	63	81	81
2007	23	0	14	25	55	64	77	84
2008	24	4	9	17	52	64	81	84

Figure 8.1.4: Variation in Proportion of patients with serum albumin ≥ 35 g/L, PD centres 2008



SECTION 8.2: BODY MASS INDEX (BMI) ON DIALYSIS

Table 8.2.1 indicates the mean BMI for HD patients from 1999 to 2008. For the year 2008 the mean BMI is 23.5 ± 7.5 for a HD population of 12092. This indicates that overall mean BMI trend is stabilizing at 23 [23.5 in 1999 to 23.5 in 2008] despite a 4.5-fold increase in patient numbers from 1999 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 1999 to 31% in 2008. 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 percentage of patients with BMI <18.5 remains at 14%. Figure 8.2.1 reflects the increasing BMI trend curve for 2008 continues to move right.

Table 8.2.1: Distribution of BMI, HD patients, 1999-2008

year	n	Mean	SD	Median	LQ	UQ	% patients <18.5	% patients 18.5-25	% patients ≥ 25
1999	2711	23.5	15.9	21.4	19.2	24.4	18	61	21
2000	3859	22.9	11.7	21.6	19.3	24.5	18	60	22
2001	4551	23	11	21.9	19.3	24.7	18	59	23
2002	5103	23.2	10.6	22	19.5	24.9	16	59	24
2003	5989	23.1	9.7	22.1	19.5	25.1	16	58	26
2004	6774	23.3	9	22.4	19.8	25.4	14	58	28
2005	7836	23.4	9	22.5	19.8	25.6	14	57	29
2006	9782	23.3	7.9	22.6	19.9	25.7	14	56	29
2007	10498	23.4	7.9	22.7	19.9	25.8	14	56	30
2008	12092	23.5	7.5	22.8	20	26	14	55	31

Figure 8.2.1: Cumulative distribution of BMI, HD patients 1999-2008

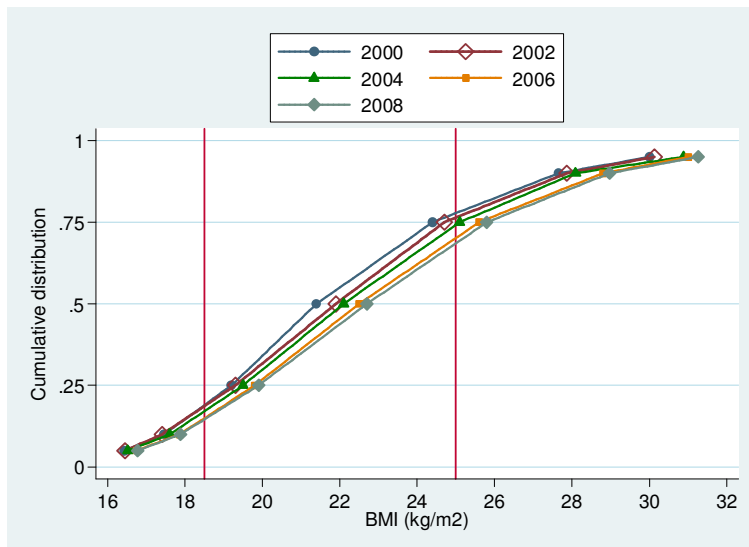
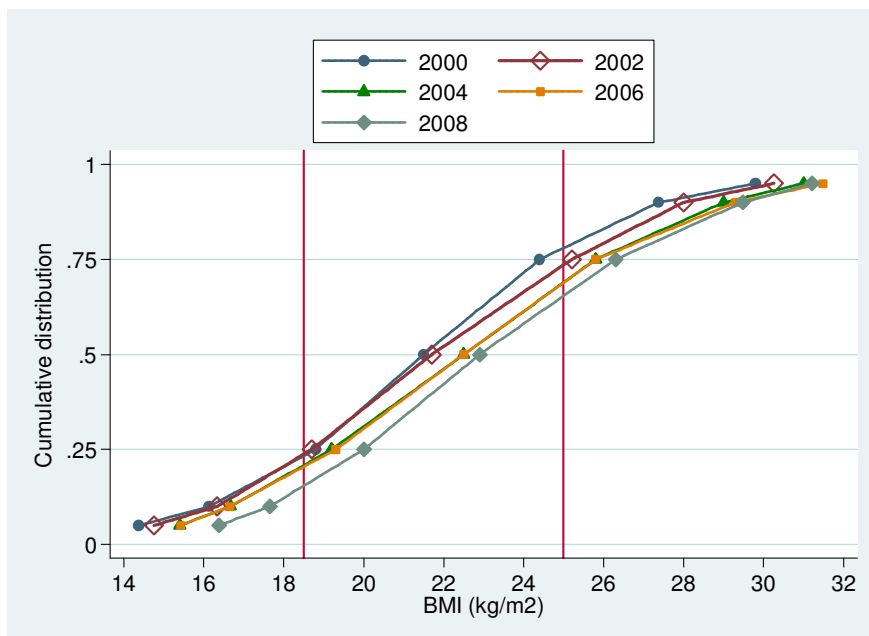


Table 8.2.2: Distribution of BMI, PD patients 1999-2008

year	n	Mean	SD	Median	LQ	UQ	% patients <18.5	% patients 18.5-25	% patients >=25
1999	552	21.7	4.5	21.5	18.8	24.4	23	56	22
2000	603	21.6	4.6	21.5	18.5	24.6	25	53	22
2001	665	22	5.1	21.7	18.7	25.2	24	50	27
2002	752	22.2	5	22.1	18.7	25.5	24	47	30
2003	1072	22.8	6.9	22.5	19.2	25.8	20	50	30
2004	1176	23.1	7.2	22.5	19.4	26	19	50	31
2005	1223	23	7.2	22.5	19.3	25.8	20	50	30
2006	1421	23.3	8.3	22.6	19.6	26.1	16	51	33
2007	1620	23.4	5.9	22.9	20	26.3	15	51	34
2008	1874	23.8	7.7	23.2	20.2	26.6	14	50	36

Figure 8.2.2: Cumulative distribution of BMI, PD patients 1999-2008



Less variation was observed for BMI measurements amongst 324 HD centers for 2008. The median of participating centres was 88%. The best centre had all (100%) patients achieving BMI ≥ 18.5 (target), while the worst center had 58% 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 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	70	55	62	78	83	90	94	100
2000	93	53	65	77	83	89	96	100
2001	113	60	68	78	84	88	92	100
2002	133	55	67	79	85	88	100	100
2003	156	60	69	79	84	91	100	100
2004	188	62	68	81	86	91	100	100
2005	206	64	70	81	88	93	100	100
2006	263	53	70	80	86	92	100	100
2007	277	56	70	81	87	92	100	100
2008	324	58	70	82	88	92	100	100

Figure 8.2.3 indicates the variation amongst 324 HD centers reporting the proportion of patients achieving the target BMI ≥ 18.5 for the year 2008. The centre with the least achievement recorded 58% of patients achieving this target.

Figure 8.2.3: Variation in Proportion of patients with BMI ≥ 18.5 among HD centres 2008

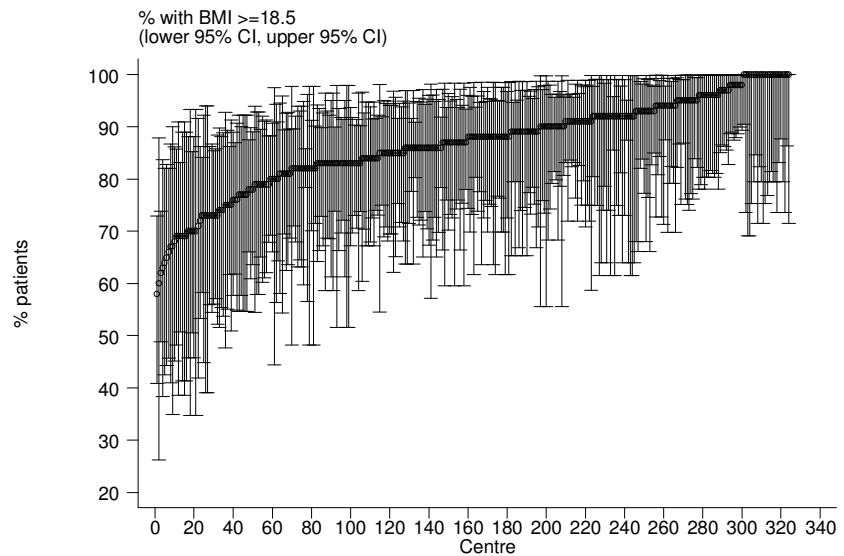


Table 8.2.4: Variation in Proportion of patients with BMI ≥ 18.5 among PD centres 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
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	15	15	63	81	85	87	87
2003	19	18	18	63	81	88	96	96
2004	19	26	26	71	82	89	94	94
2005	18	23	23	69	83.5	87	91	91
2006	22	19	25	78	84	91	92	93
2007	22	18	27	76	87	92	97	100
2008	22	25	34	78	88	91	95	100

Figure 8.2.4: Variation in Proportion of patients with BMI ≥ 18.5 among PD centres 2008

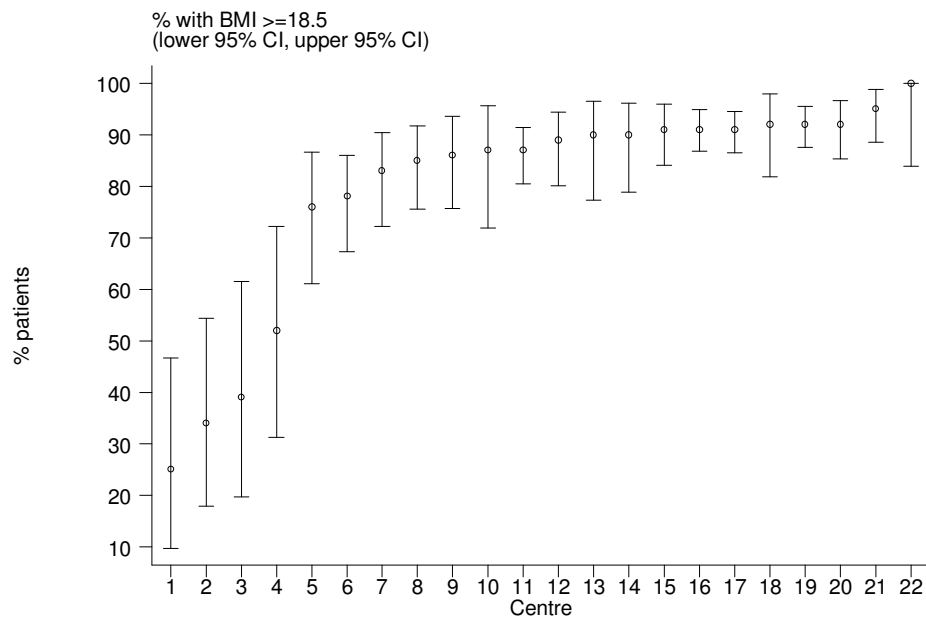


Table 8.2.5: Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among HD centres 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	63	2	7	23	44	61	71	83
2000	83	0	8	20	36	50	73	81
2001	105	0	3	10	32	50	69	100
2002	124	0	6	25.5	37.5	55	73	100
2003	150	0	18	34	47	62	78	100
2004	181	3	10	34	51	64	79	100
2005	198	5	10	38	50	63	80	90
2006	251	0	9	35	47	64	77	92
2007	270	0	9	32	47	60	74	93
2008	311	0	4	30	45	60	76	93

Table 8.2.5 & Figure 8.2.5 indicate that of 311 centres returning data on targeted goals of BMI ≥ 18.5 and serum albumin ≥ 40 g/dL in 2008, the maximum achievement was by 93% of patients in one center whereas the lowest achievement was reported as 4% in another center. The median of participating centres was 45%. For all HD centres, there was 19-fold variation in meeting targeted goals (Table 8.2.5 & Figure 8.2.5). This wide variation indicates room for improving the nutritional status of HD patients.

Figure 8.2.5: Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 40 g/dL among HD centres 2008

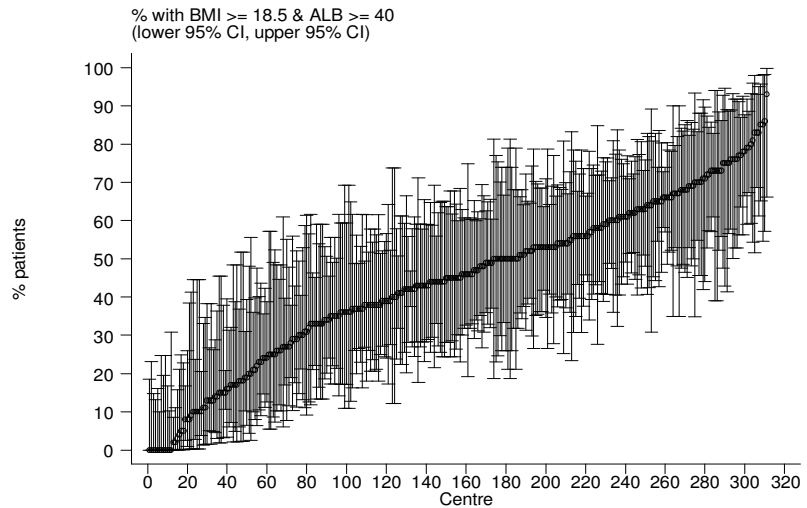


Table 8.2.6: Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 35 g/dL among PD centres 2008

year	No. of centers	Min	5th centile	LQ	Median	UQ	95th centile	Max
1999	9	0	0	31	34	38	55	55
2000	11	0	0	24	38	61	75	75
2001	11	5	5	22	36	46	71	71
2002	15	10	10	20	40	50	67	67
2003	19	10	10	21	35	47	77	77
2004	19	9	9	20	44	56	81	81
2005	18	8	8	22	33.5	54	67	67
2006	22	7	10	24	43.5	55	63	65
2007	22	11	13	18	45.5	58	70	76
2008	22	5	8	17	34	54	71	76

Figure 8.2.6: Variation in Proportion of patients with BMI ≥ 18.5 and serum albumin ≥ 35 g/dL among PD centres 2008

