

THE PATHOLOGIC PHYSIOLOGY OF PELLAGRA: *I. Tabulated Clinical and Physiologic Data*

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THE PATHOLOGIC PHYSIOLOGY OF PELLAGRA

I. TABULATED CLINICAL AND PHYSIOLOGIC DATA

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Pellagra is almost unique among major diseases in the scarcity of accurate information concerning it. There is still uncertainty about its etiology; the nature of its pathologic lesion is obscure; the diagnosis in atypical cases is a mere matter of opinion; and there are no adequate criteria for cure or for prognosis. The pellagrin who remains ill for a prolonged period may be suffering from chronic pellagra or may be suffering from some mysterious sequel rather than the disease itself. Prognosis is based chiefly on mass statistics largely unmodified by the clinical features of the individual patient. Even the causes of death are little understood. Pellagrins frequently die unexpectedly when apparently convalescent. The treatment at present is highly unsatisfactory. More than 25 per cent of the pellagrins admitted to the New Orleans Charity Hospital die in the hospital, in spite of treatment along the most approved lines. The treatment is dietary and symptomatic. The dietary is based on inexact knowledge of the dietary fault to be overcome. The symptomatic treatment rests on imperfect knowledge of the disturbed physiology represented by the symptoms. Pellagra takes a variety of clinical forms, so that some writers have suggested that what is called pellagra is a mixture of diseases rather than an entity. If typical skin lesions are accepted as a *sine qua non* there can be little doubt that pellagra is a unique disease for there is hardly any lesion in medicine more distinctive clinically. Even with classic skin lesions the cases fall into sharply contrasting groups. The mechanisms which bring this about are quite mysterious. The studies upon which this and subsequent papers are based were undertaken with the belief that there was no better mode of attack on many of the

4	C. F.	44	—	10	27	4	3	2	DU	4	1	0	0	0	0	0	0	0	0	70	41.826.73,540(2,590	1,040(3,933.487.3110.3	3.7	612	44	Syphilis	
											0	0	0	0	0	0	0	0	0	0	42.224.73,570(2,670	890(3,863.076.9313.0	3.5	496	61	Improved	
											0	0	0	0	0	0	0	0	0	0	43.131.43,460(2,340)	1,090(3,723.747.46	9.8	4.1	580	139	Discharged improved
5	C. F.	18	—	8	5	1	D	8	1	0	0	0	0	0	0	0	0	0	0	59	53.637.94,380(2,670	1,660(3,932.806.7311.2	4.3	616	58	Third annual attack Improved	
6	C. M.	26	—	14	2	2	E	3	1	0	0	0	0	0	0	0	0	0	0	63	53.542.74,200(2,400	1,800(3,862.115.9710.3	4.1	530	62	Probable attack 4 months previously	
											0	0	0	0	0	0	0	0	0	0	54.541.25,100(2,990	2,120(2,882.705.58	9.3	3.2	536	149	Clinically stationary
7	W. M.	19	—	13	1	1	E	2	1	0	0	0	0	0	0	0	0	0	0	61	38.142.6	2,972.105.07	9.3	4.0	508	118	Chronic alcoholism. Died 3 days later
											0	0	0	0	0	0	0	0	0	0	37.443.54,830(2,670	2,100(3,721.214.586	8.5	4.3	530	127	Urethral stricture; active gonorrhea
											0	0	0	0	0	0	0	0	0	0	37.237.64,500(2,790	1,690(3,262.455.7111.7	4.1	498	136	Unimproved	
											0	0	0	0	0	0	0	0	0	0	37.436.84,980(3,090	1,840(3,182.385.5610.9	4.2	500	68	Tuberculous peritonitis Transfusion 500 cc. whole blood	
8	W. M.	43	—	17	2	1	E	2	3	3	0	D	?	—	0	0	0	0	0	75	45.348.93,360(1,680	1,640(3,121.194.3111.0	4.3	520	53	Unimproved	
9	C. M.	23	—	11	1	3	E	3	1	1	0	0	0	0	0	0	0	0	0	65	62.725.75,120(3,770	1,320(2,483.686.16	9.6	4.1	474	144	Transfusion 500 cc. whole blood
											0	0	0	0	0	0	0	0	0	0	61.724.75,220(3,990	1,190(2,414.046.4510.3	3.6	490	59	Unimproved	
											0	0	0	0	0	0	0	0	0	0	61.122.95,230(3,990	1,190(2,003.285.28	8.9	3.8	560	152	Died 3 days later
											3	1	0	0	0	0	0	0	0	3	57.628.65,180(3,670	1,490(2,373.836.2010.4	3.5	530	50	Transfusion 500 cc. whole blood Improved	
											?	1	0	0	0	0	0	0	0	?	55.223.85,730(4,080	1,630(1,893.565.4511.8	4.1	530	62	Died 1 month later	
10	C. M.	26	—	14	3	1	E	50	3	0	0	0	0	0	0	0	0	0	0	63	58.615.38,000(6,780	1,220(2,713.486.19	9.8	4.6	542	145	Early carcinoma of cervix Radium applied 1 week before second study
											3	0	0	0	0	0	0	0	0	1	62.018.88,420(6,830	1,580(2,853.075.92	8.7	3.8	580	162	Improved
											3	0	0	0	0	0	0	0	0	1	61.319.18,280(6,680	1,600(2,382.815.19	8.6	2.6	606	154	Improved
11	C. F.	28	—	13	4	3	U	4	3	4	0	0	0	0	0	0	0	0	0	60	45.927.43,760(2,900	850(1,988.2.324.19	8.8	2.5	444	145	Transfusion 500 cc. whole blood Improved
12	W. F.	37	—	11	3	5	U	3	1	2	0	0	0	0	0	0	0	0	0	60	42.431.83,470(2,330	1,100(3,611.815.42	9.8	4.5	500	145	Died 1 month later
											0	0	0	0	0	0	0	0	0	0	42.238.34,570(2,790	1,750(3,462.265.7210.7	5.0	500	57	Improved	
13	W. F.	27	—	11	4	2	1	D	50	1	0	0	S	0	A	0	1	59	48.133.13,170(2,100	1,050(2,862.325.23	9.5	3.1	530	55	Improved		
14	C. F.	39	—	11	5	3	1	D	2	1	1	0	0	0	N	0	0	0	0	61	66.832.05,370(3,610	1,720(3,342.195.53	9.8	4.3	528	154	Improved
											0	0	0	0	0	0	0	0	0	0	62.632.26,720(4,540	2,180(3,482.025.5010.6	4.7	540	59	Improved	
											0	0	0	0	0	0	0	0	0	0	63.533.86,250(4,120	2,120(3,152.225.3710.6	4.2	542	58	Improved	

TABLE 1—Continued

Case number	Race	Sex	Age yrs.	Interval days	Skin lesions				Diarrhea		Vomiting	Psychoses	Neuritis	Gastric acidity	Edema	Fever	Weight		Red blood cell volume cc.	Blood volume cc.	Plasma volume cc.	Volume packed red blood cells cc.	Serum proteins			Calcium mgm. per 100 cc.	Inorganic phosphorus mgm. per 100 cc.	Chloride as NaCl mgm. per 100 cc.	CO ₂ capacity plasma vol. per 100 ccs.	Total base m. eq. per liter	Remarks	
					Duration	Extent	Severity	Present state	Duration	Severity							Ideal kgm.	Present kgm.					Albumin gms. per 100 cc.	Globulin gms. per 100 cc.	Total gms. per 100 cc.							
15	C.	M.	61	—	1	3	3	B	1	2	1	0	0	0	0	0	2	72	49.5	44.2	260	740	1,470	2,873	3,075	94	10.7	3.4	492	71	138	Improved
16	C.	F.	60	—	4	3	3	U	4	3	4	1	C	?	A	0	64	38.0	31.4	3,060	2,100	930	3,882	2,886	76	10.1	4.2	500	62	147	Skin lesions probably recurrent Died 1 day later	
17	C.	M.	46	—	4	2	2	E	0	0	3	0	0	0	0	0	61	40.8	38.8	730	2,260	1,440	3,881	2,895	77	9.9	4.1	500	69	—	Skin lesions and diarrhea developed in the hospital Died 3 hours later. Autopsy	
18	C.	M.	55	—	3	2	3	U	10	2	1	0	0	0	0	1	74	57.2	51.4	3,300	3,000	1,350	3,943	3,077	01	10.4	3.6	500	57	—	Luetic heart disease Died suddenly 4 days later	
19	W.	F.	46	—	4	2	1	DE	4	2	0	0	0	0	0	1	61	40.3	32.3	3,390	2,290	1,080	3,341	1,965	30	9.8	5.1	500	65	—	Recurrent skin lesions Unimproved	
20	C.	M.	44	—	3	3	2	D	3	1	1	0	0	0	0	1	70	47.2	30.7	5,500	3,790	1,680	3,782	2,276	05	9.5	3.2	616	71	—	Syphilis	
21	W.	F.	29	—	12	3	2	DU	12	2	1	0	0	2	H	0	1	38.0	34.0	3,530	2,350	1,170	2,631	1,934	56	10.7	4.8	530	59	—	Recurrent skin lesions. Active delirium 1 week later, then died	

22	C. F.	11	-	12	2	3	D	12	2	2	1	0	D	0	-	0	0	43	27,228.0	-	-	-	2,223.05	5.27	8.5	5.2	432	53	Died 1 hour later
23	C. M.	10	-	16	3	3	D	4	2	2	1	0	0	0	0	0	0	35	24,130.1	12,570.1	770	2.81	2.11	4.92	5.3	464	51	Improved	
			10				U												24,131.1	2,580.1	800	2.84	2.03	4.87	6.7	512	63		
24	C. F.	34	-	5	3	1	H	12	3	0	0	0	D	0	A	0	0	61	48,725.2	4,240.3	090	1.12	0.23	28.5	3.8	568	53	Stricture of rectum Discharged unimproved	
			5				H	3	0	1	0	1	D	0					48,728.9	3,960.2	790	1.14	0.31	13.26	5.7	544	29		
25	W. F.	16	-	12	5	1	H	4	1	0	0	0	0	0	A	0	0	56	36,334.5	2,860.1	830	990	4.82	2.07	02	5.7		53	Pyralism. Diarrhea had stopped 3 months before admission
			7				H	0	0	0	0	1	0	0					36,830.6	2,640.1	810	4.04	2.13	6.17	6.2	614	57		
			11				H	0	0	0	0	0	0	0					37,232.5	3,130.2	110	1,000	4.16	2.17	6.33	3.4	604	50	
			7				H	0	0	0	0	0	0	0					37,533.8	2,600.1	700	880	4.14	2.15	6.29	4.8	590	60	
			8				H	0	0	0	0	0	0	1					37,636.1	2,950.1	870	1,060	4.10	2.27	6.37	5.6	600	56	Clinically stationary
26	W. F.	23	-	6	2	1	H	0	0	1	0	0	0	0	A	0	0	54	44,831.8	3,500.2	350	1.11	0.31	16.1	4.7	611		Third annual attack. Was edematous 5 days ago. Improved	
27	C. F.	39	-	4	2	2	DU	0	0	1	0	0	0	1	A	0	1	56	36,325.2	2,800.2	060	710	3.89	2.42	6.31	4.4	558	60	
			9				D	1	0	0	0	0	0	0					34,028.6	2,230.1	570	640	3.93	2.93	6.86	5.4	578	54	
			9				H	0	0	0	2	0	0	0					33,332.2	2,780.1	860	890	3.65	2.49	6.14	6.3	584	59	
			8				H	1	0	0	0	0	3	0					34,034.5	2,810.1	810	970	3.72	2.63	6.35	5.8	560	52	
			12				H	0	0	0	0	0	0	2					33,238.5	3,340.2	040	1,280	3.43	2.30	5.73	5.4	540	57	
			14				H	0	0	0	0	1	0	0					34,138.6	3,130.1	900	1,210	3.47	1.95	5.43	5.2	500	60	143
			12				H	0	0	0	0	0	0	1					34,939.9	3,380.2	010	1,350	3.74	2.00	5.74	5.4	540	66	157
28	W. F.	26	-	5	2	1	H	0	0	2	0	0	0	0	-	1	0	53	37,233.3	2,620.1	770	830	3.41	3.44	6.85	4.2	584	62	Stricture of rectum; recto- vaginal fistula. Unim- proved
29	W. M.	36	-	4	2	1	E	0	0	1	0	0	0	0	A	0	0	67	52,236.0	4,940.3	110	1,780	4.03	2.32	6.35	3.2	620	58	
			7				E	0	0	0	0	0	0	0					52,735.5	4,550.2	890	1,610	3.91	2.37	6.28	3.4	540	55	Unimproved
30	W. M.	44	-	6	3	1	E	0	0	1	2	0	0	0	-	0	0	75	78,549.8	8,780.4	330	4,380	4.19	2.32	6.51	3.5	651	52	Unimproved
31	C. M.	53	-	1	1	1	E	0	0	0	0	0	0	0	A	0	0	70	59,043.4	5,580.3	150	2,420	3.60	3.01	6.61	3.4	492	53	Luetic heart disease
			10				D	0	0	0	0	0	D	0					58,141.6	5,680.3	220	2,420	2.90	2.88	5.80	3.2	600	47	Died suddenly 3 days later

TABLE 1—Continued

Case number	Race	Sex	Age yrs.	Interval days	Skin lesions				Diarrhea		Glossitis	Vomiting	Psychoses	Neuritis	Gastric acidity	Edema	Fever	Weight		Red blood cell volume cc.	Blood volume cc.	Plasma volume cc.	Volume packed red blood cells cc.	Serum proteins			Calcium mgm per 100 cc.	Inorganic phosphorus mgm per 100 cc.	Chloride as NaCl mgm per 100 cc.	CO ₂ capacity plasma vol. per cent	Total base m. eq. per liter	Remarks		
					Duration	Extent	Severity	Present state	Duration	Severity								Present	Ideal					Albumin gms. per 100 cc.	Globulin gms. per 100 cc.	Total gms. per 100 cc.							Albumin gms. per 100 cc.	Globulin gms. per 100 cc.
32	C.	F.	25	—	12	4	1	DE	0	0	2	0	0	0	A	0	1	38.1	35.0	2,790	1,780	980	3.24	2.06	5.30	10.9	4.1	552	46	144	Recurrent skin lesions			
					13			HD	0	0	0	0	0	0	0	0	0	0	0	36.3	34.7	3,390	1,900	1,175	3.30	1.69	4.99	10.3	3.8	532	47	152		
					11			H	0	0	0	0	0	0	0	0	0	0	0	37.2	38.0	3,520	1,940	1,340	3.99	1.58	5.57	11.9	3.4	552	53	154		
					13			H	0	0	0	0	0	0	0	0	0	0	0	38.1	32.0	3,200	1,500	1,030	3.93	1.59	5.52	11.0	3.8	570	54	154	Improved	
					15			H	0	0	0	0	0	0	0	0	0	0	0	39.9	31.7	3,300	2,240	1,050	3.26	1.74	5.00	10.4	3.6	560	54	139		
33	C.	F.	39	—	4	4	1	D	0	0	0	0	0	A	0	0	70	62.5	31.8	4,240	2,860	1,350	2.97	4.60	5.57	11.8	3.2	538	51	146	Stricture of rectum. Probable previous mild annual attacks Improved			
					14			H	0	0	0	0	0	0	0	0	0	0	59.9	31.0	5,150	3,520	1,600	2.83	4.85	7.68	10.8	4.4	562	54	146			
					13			H	0	0	0	0	0	0	0	0	0	0	59.4	32.2	4,630	3,100	1,490	2.73	5.11	7.84	6.0	3.9	570	60	146			
					13			H	0	0	0	0	0	0	0	0	0	0	60.3	29.6	5,200	3,620	1,540	2.63	4.18	6.80	11.1	4.7	552	60	146	Chronic alcoholism. De-serted		
					—			E	0	0	0	0	0	0	0	0	0	0	46.3	50.4	3,470	1,720	1,680	5.46	2.14	7.50	11.3	4.9	51	49	138	Returned with additional lesions		
34	W.	M.	29	60	14			HD	0	0	0	0	0	A	0	0	44.4	52.0	3,200	1,520	1,680	3.96	1.72	5.68	11.4	4.1	512	49	143	Slight improvement				
					14			H	0	0	0	0	0	0	0	0	0	0	39.3	47.9	3,770	1,950	1,800	4.01	1.62	5.64	11.0	4.7	556	54	161			
					14			H	0	0	0	0	0	0	0	0	0	0	38.5	46.9	2,690	1,400	1,260	3.51	1.83	5.34	14.3	4.3	530	55	143			
					14			H	0	0	0	0	0	0	0	0	0	0	37.6	42.2	—	—	—	—	—	3.28	1.46	4.17	11.1	4.5	574	54	143	
					12			H	0	0	0	0	0	0	0	0	0	0	37.6	44.2	—	—	—	—	—	3.94	1.63	5.54	10.9	5.2	564	56	141	Stricture of rectum. Recur-rent skin lesions
35	C.	F.	30	—	12	3	1-3	DU	0	0	1	0	0	H	0	0	60	52.0	22.3	3,630	2,820	810	3.37	2.26	5.63	11.9	4.2	530	56	144	Improved			
					14			HU	0	0	0	0	0	0	0	0	0	0	50.9	22.5	3,570	2,740	810	3.38	2.50	5.88	10.1	4.4	588	57	144			
					13			HD	0	0	0	0	0	0	0	0	0	0	55.1	22.7	4,100	3,160	930	3.22	2.50	5.72	9.2	3.8	600	49	155			
					14			H	0	0	0	0	0	0	0	0	0	0	58.6	25.0	4,350	3,250	1,090	3.14	2.71	5.85	10.4	4.5	550	54	123	Recurrent skin lesions. Died 28 hours later		
36	C.	F.	23	—	10	3	1-3	DU	3	1	3	0	D	0	A	0	2	44.5	19.6	3,810	3,060	750	1.71	3.80	5.57	7.4	2.6	356	57	123				
					—			DU	0	0	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

37	W. F.	50	—	8	3	1	H	1	2	0	0	0	0	0	0	0	0	63	52.2	34.0	3.4	440	2.110	1.320	4.22	2.41	6.63	10.1	3.2	540	58	142	Mild hypothyroidism. Discharged unchanged. Third annual attack					
38	C. F.	32	—	12	3	1	HE	0	0	0	0	0	0	0	0	0	0	62	66.7	40.8	5.090	2.970	1.980	3.152	2.09	5.24	11.1	4.0	560	55	137	Recurrent skin lesions. Recto-vaginal fistula						
13							HD																															
14							H																															
15							H																															
39	C. F.	22	—	4	3	2	D	1	1	0	0	0	0	0	0	0	0	57	62.2	35.7	4.740	3.050	1.690	3.66	2.97	6.63	10.4	3.3	490	64	139	Previous attack 7 years ago						
16							H																															
13							H																															
40	C. F.	28	—	4	5	2	DB	0	0	1	0	0	0	0	0	0	0	58	53.3	32.8	4.430	2.930	1.450	3.68	2.14	6.42	11.1	5.2	564	49	141	Recurrent skin lesions						
10							U																															
5							U																															
41	C. F.	32	—	2	2	1	E	3	0	1	0	0	0	0	0	0	0	60	45.7	35.8	3.140	1.980	1.120	3.71	2.42	6.13	10.0	4.5	530	59	135	Died 17 hours later						
9							DU																															
14							D																															
42	W. F.	30	—	2	4	2	ED	0	0	1	0	0	0	0	0	0	0	56	38.7	34.1	3.740	2.450	1.270	3.40	2.09	5.49	10.3	4.9	480	55	149	Chronic alcoholism Unimproved						

Skin lesions: Duration: Time in weeks since appearance of skin lesions of present attack. In a number of cases before skin lesions were healed fresh ones appeared. These are referred to as recurrent skin lesions. They are considered as being a part of the same attack of pellagra as the unhealed lesions. Figures in this column do not refer to the time of appearance of recurrent lesions.

Extent: Figures in this column indicate roughly the surface area involved. The areas referred to are those most commonly involved, their equivalents in extent elsewhere is occasionally substituted.

1 = parts of hands only. 2 = entire surface of hands exclusive of palms. 3 = hands and forearms or elbows. 4 = hands and feet. 5 = hands and feet plus other extensive areas.

Severity: Terminology that of burns: 1 = first degree. 2 = second degree. 3 = third degree. Third degree pellagra lesions on healing do not cause contracture but the skin is far from normal.

State: Condition of lesions at the time of study. B = bullae. U = ulceration. E = erythema. D = desquamation. H = healed.

Diarrhea: Duration: Weeks after onset.

Severity: 1 = 3 to 6 times a day. 2 = 7 to 10 times. 3 = 11 or more times a day.

Glossitis: 1 = mild diffuse redness. 2 = marked diffuse injection with pain. 3 = marked injection plus areas of ulceration. 4 = bald tongue due to atrophy of papillae.

Vomiting: 0 = absent. 1 = occasional. 2 = 3 to 5 times daily.

Psychosis: D = delirium. C = coma. S = suicidal depression.

Neuritis: Symptoms of peripheral neuritis in legs but with exaggerated knee jerks. 1 = mild, chiefly subjective. 2 = moderate. 3 = severe bedridden. — = information not available.

Gastric acidity: A = absence of free hydrochloric acid. N = normal acidity. H = hyp acidity. — = information not available.

Edema: Pitting edema: 1 = just demonstrable. 2 = moderate in degree and distribution. 3 = anasarca.

Fever: 1 = temperatures up to 101.5°F. 2 = more than 101.5° but less than 103°F. 3 = temperatures higher than 103°F.

Blood volume: The figures in italics are estimated values obtained by comparing the hematocrit at that particular time with the hematocrit of the preceding or following study. The calculation is based on the assumption that the volume of circulating blood cells is unchanged from one occasion to the next.

Weight: Given in kilograms. Ideal weights are those given by the tables of the Medico-Actuary Mortality Investigations (5) for sex, age, and height.

problems of pellagra than the accumulation of more exact knowledge of the disturbed physiology.

All patients studied were in-patients of Charity Hospital, and all had typical skin lesions of pellagra together with other evidences of the disease.

Detailed methods will be presented as indicated in subsequent papers of this series.

The first study was usually made one or two days after admission to the hospital, and with few exceptions the blood volume was determined each time blood was taken for chemical study. The studies were repeated, provided the patients remained sufficiently long under observation, at intervals of from 5 to 15 days. All patients were given during their stay in the hospital a special "pellagra diet." This diet has a daily caloric value of 2500 to 3500 calories, contains more than 100 grams of protein, a part of which is liver or sweetbread, and contains an abundance of green leafy vegetables and 500 cc. buttermilk. It is given to patients with diarrhea in bland form, and, when necessary, a liquid diet of similar caloric value was given by gavage. Routinely there was included for the vitamin content 30 cc. of fresh brewer's yeast three times a day, 150 cc. of orange or lemon juice daily and in addition some of the patients received 4 cc. of cod liver oil three times a day. The nurses usually took especial interest in their pellagrins and in their nutrition and fluid intake.

No particular effort was made to influence by treatment the derangements of physiology revealed in these studies. Therapeutic studies are to be made later. In the present studies pellagra was observed under what has been considered an excellent regimen.

The detailed clinical information, the blood volumes, and the results of chemical studies are shown for 42 cases in table 1.

The pellagrins which we have studied made a fairly representative group. The proportion of severe cases of pellagra is much greater in hospital than in general practice, but mild forms of the disease are also present.

In subsequent articles (1, 2, 3, 4) detailed procedures will be presented and the results of the physiologic investigations analyzed and discussed.

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SUMMARY OF CLINICAL DATA

Detailed clinical data obtained from a study of 42 pellagrins are recorded in one table which also includes the results of determinations of circulating blood volume, serum albumin and globulin, serum calcium and inorganic phosphorus, of plasma chlorides, of carbon dioxide combining power, and of serum total base.

The group of patients consisted of 6 white men, 9 white women, 9 negro men, 16 negro women, and 2 negro children. Twenty were less than 30 years old and 36 were less than 50.

Thirteen patients, 31 per cent, died in the hospital.

Thirty-nine had had no previous attacks of pellagra; 3 had had attacks 1 to 7 years previously.

Eleven patients of the group had other diseases: Syphilis, 5, two with heart disease; stricture of the rectum, 4; active gonorrhea, 1; intestinal tuberculosis, 1.

Fifty-nine per cent of the patients were more than 20 per cent underweight and 35 per cent more than 30 per cent underweight, and 10 per cent were overweight.

Eight patients showed edema.

The skin lesions at the time of the first study showed erythema in 26, 62 per cent; 9 of the 26 showed recurrent lesions in the presence of older unhealed lesions.

Vomiting was a serious problem in 2 patients.

Glossitis was present in 26, 62 per cent; diarrhea in 25, 60 per cent.

Gastric analysis was done in 34 and achylia found in 29, 60 per cent, of the entire group; hypoacidity in 3, and a normal acidity in 2 patients.

Seven patients were delirious, 2 were comatose and 1 suicidal; a total of 10, 24 per cent, with psychoses.

Six patients showed evidences of peripheral neuritis.

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