Clinical Studies in the Urine of the Insane.

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Being a Thesis for the degree of M.D.

I Quantity of urine passed in 24 hrs, by insane patients
II The specific gravity of the urine
III Mineral deposits in the urine
IV The presence of albumen in the urine

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Approved

W.S.

But I should not recommend
publication in present shape, as
I think the conclusions are often
crudely presented & in some cases
not well founded etc.
See especially p. 34 the points
I recognise, however, the pains
bestowed on the inquiry, even
if not always convincing as regards
results.

The following clinical investigation took place in Hartwood Asylum during the period, I occupied the position of Assistant Medical officer there. I was ably assisted by the hearty co-operation of the staff, particularly the Head-night-Attendant, and one patient of a scientific cast of mind — Mr. O. My best thanks are due to them, and also to Dr. Campbell Clark, whose zeal in lunacy work is well known.

The results here given are based on an examination of the urines passed during the night by 150 ~~p~~ lunatic patients and of the urines passed during the day after dinner of 50 patients.

All these patients were practically submitted to the same conditions of life, — food, rest, and exercise.

I may say the work occupied my close attention for the greater part of a year and proved to be a laborious task.

The diet of the patients was simple, Jet wholesome, and consisted of three meals a day, which were arranged as follows.

1. Breakfast 8 A.M.
   Porridge and milk followed with tea and bread and butter.
2. Dinner 1 P.M.
   (a) Broth, beef and potatoes
   or (b) Irish stew and suet dumpling
   or (c) Fish, potatoes and rice pudding
   or (d) Rice pudding and rhubarb tart.

The dinner was varied from day to day, but these were the chief varieties.

3. Tea 6 P.M.
   Bread and butter and tea.

The patients rose at 6 A.M., and went to bed at 8 P.M., and had a fair amount of exercise daily.

I

Quantity of urine passed in 24 hours by insane patients.

The urine, which was passed from 6 A. M morning to 8 P. M. evening, was collected and measured and is recorded under 8 P. M. — the day-urine: the urine passed from 8 P. M. to 6 A. M, representing the night-urine is recorded under 6 A. M.
In several cases, the daily fluctuations are given.
The tables are arranged to show the different types of insanity.

1. Adolescent Type

Cases.		6 A.M.	8 P.M.	Total
1. Alex: S.	(1)	30 oz	24 oz	54 oz
	(2)	26 "	14 "	40 "
	(3)	16 "	30 "	46 "
2. Samuel N.	(1)	8	20	28 "
	(2)	12	10	22 "
	(3)	6	26	32 "
3 James S.	(1)	18	28	46 "
	(2)	16	35	51 "
	(3)	30	24	54 "
4 John M.	(1)	18	23	41 "
	(2)	12	26	38 "
	(3)	24	32	56 "
5 Robt A.		37	15	52
6 Jas: S		20	130 ·x·	150
7 Joseph G.		27	25	52
8 Jamieson S.		13	20	33
9 John M.		32	8	40
10 Jas: R.		20	17	37
11 Francis M.		47	23	70
12 Daniel M		25	7	32
13 Jas: D.		21	25	46
14 Peter B.		18	40	58
15 Alexander P.		11	13	26
16 Lewis M.		9	27	36
17 Robert J.		30	29	59
18 Thomas D.		19	38	57
19 Arch: N.		10	20	30
20 John B.		38	12	50
21 J. B.		45	10	55

·x· Case 6 Jas: S. was in the habit of drinking water incessantly during the day.

2. Demented Type

Cases.		6 A.M.	8 P.M.	Total.
1 Jas. L. K.	(1)	20½ oz	28½ oz	48½ oz
	(2)	20 "	19 "	39 "
	(3)	16 "	25 "	41 "
2 John R.	(1)	20 "	20 "	40 "
	(2)	45 "	11 "	56 "
	(3)	54 "	17 "	71 "
3 John F.	(1)	8 "	15 "	23 "
	(2)	9 "	22 "	31 "
	(3)	16 "	9 "	25 "
4 William McM.	(1)	26 "	28 "	54 "
	(2)	18 "	26 "	44 "
	(3)	10 "	20 "	30 "
5 John B.	(1)	20 "	28 "	48 "
	(2)	20 "	30 "	50 "
	(3)	28 "	36 "	64 "
6 Thomas L.	(1)	8 "	24 "	32 "
	(2)	16 "	20 "	36 "
	(3)	18 "	30 "	48 "
7 Donald R.	(1)	20 "	22 "	42 "
	(2)	25 "	20 "	45 "
	(3)	10 "	38 "	48 "
8 James M.	(1)	12 "	18 "	30 "
	(2)	10 "	35 "	35 "
	(3)	8 "	32 "	40 "
9 Daniel G.		36 "	30 "	66 "
10 Patrick B.		25 "	14 "	39 "
11 Robert R.		25½	49 "	74½ "
12 Robert McC.		20 "	33 "	53 "
13 Arch: R.		38 "	40 "	78 "
14 Jas: L.		14 "	20 "	34 "
15 Thomas H		19 "	9 "	28 "
16 Patrick G.		30	7	37
17 Andrew H.		20	8	28
18 Jas: D.		32	8	40
19 Jas: R		7	23	30
20 Daniel H		20	12	32
21 Thos: M.		26	27	53

3. Melancholic Type

Cases	6 A.M.	8 P.M.	Total
1 Robt McG. (1)	30 oz	26 oz	56 oz
(2.)	30 "	23 "	53 "
(3)	47 "	17 "	64 "
(4)	27 "	12 "	39 "
2 Mungo B. ✕	90 "	70 "	160 "
(Diabetes Insipidus)	92 "	52 "	144 "
	128 "	52 "	180 "
3 John McD.	16 "	20 "	36 "
4 Patrick S.	5 "	35 "	40 "
5 Duncan S.	5 "	32 "	37 "
6 Murdoch S.	50 "	22 "	72 "
7 Jas: B	28 "	29 "	57 "
8 George B.	27 "	11 "	38 "
9 John L.	35 "	23 "	58 "
10 Wm K.	36 "	24 "	60 "
11 Wm J.	9 "	29 "	38 "

4. Manical Type.

Cases.	6 A.M.	8 P.M.	Total
1 John S.	33 oz	39 oz	72 oz
2 John W.	32 "	45 "	77 "
3 John C.	27 "	33 "	60 "
4 Michael C.	33 "	47 "	80 "
5 Jas: S.	47 "	20 "	67 "
6 Jas: Sy:	25 "	26 "	51 "
7 Jas: H	45 "	20 "	65 "
8 Thomas T.	61 "	32 "	93 "
9 Thomas B.	62 "	25 "	87 "
10 George S.	46 "	10 "	56 "
11 Patrick H	20 "	55 "	75 "
12 Wm D.	20 "	30 "	50 "
13 Patrick C. (1)	30 "	34 "	64 "
~~Jas A.~~ (2)	20 "	28 "	48 "
" (3)	29 "	32 "	61 "
14 Wm R.	32 "	20 "	52 "

✕ Omitted from the calculation of averages.

5. Epileptic Asylum

Cases	6 A.M.	8 P.M.	Total
1 Wm B.	18 oz	10 oz	28 oz
2 John C.	20 "	12 "	32 "
3 John G.	22 "	31 "	53 "
4 Andrew S.	28 "	72 "	100 "
5 Alex: R.	27 "	34 "	61 "
6 Jas G.	26 "	40 "	66 "
7 Wm I.	47 "	62 "	109 "
8 Robert N.	30 "	23 "	53 "

6. General Paralytic Asylum

Cases	6 A.M.	8 P.M.	Total
1 Wm D.	48 oz	6 oz	54 oz
2 John McC.	12 "	24 "	36 "
3 Alex: M.	34 "	18 "	52 "
4 Wm I.	29 "	32 "	61 "
5 Geo D	59 "	20 "	79 "
6 John P.	16 "	30 "	46 "
	18 "	30 "	48 "
	35 "	12 "	47 "

4 Senile Asyl.

		6 A.M	8 P.M	Total	
1 John S.	①	35	14	49	Successive days.
	②	35	17	52	
	③	16	30	46	
2 Lachlan McK.	①	26	34	60	
	②	25	29	54	
	③	23	25	48	
3 James L.		18	30	48	
4 Jas. P.		27	23	50	
5 George D		15	35	50	
6 Jas. McK		20	25	45	
7 Thomas M.		20	20	40	
8 Wm P. (Cardiac Dropsy)	X	60	48	108	under treatment by rest in bed and digitalis
		35	58	93	
		30	20	50	
		16	20	36	

X omitted from the calculation of averages.

When the foregoing tables are analysed, the following results are brought out.

Analysis of quantity - tables showing mean - averages in ounces at the different periods.

Types.	6 A.M.	8 P.M.	Total in round Nos
Adolescent	22 oz	25 24/29 oz	48 oz
Demented	21 "	23 "	44 "
Melancholic	26 7/13 "	23 4/13	50 "
Maniacal	35 1/8 "	31	66 "
General Paralytic	31 3/8 "	21 1/2	53 "
Senile	23 7/11 "	25 7/11	49 "
Epileptic	27 1/4	35 1/2	63 "

The above table shows that patients of the maniacal type (not acute mania) pass on an average considerably more urine daily than any of the other types specified above, and that the Epileptics come next, while the demented patients pass least urine on an average. This fact is made still more obvious when the above table is arranged according to "order of merit".

Table.- Showing the daily averages of urine in the different types

Maniacal	Type	66 oz
Epileptic	"	63 "
General Paralytic	"	53 "
Melancholic	"	50 "
Senile	"	49 "
Adolescent	"	48 "
Demented	"	44 "

It will be further observed, that if the normal quantity of urine passed in perfectly healthy subjects be rated at from 50 - 60 oz daily, then we are forced to the conclusion that Patients of the maniacal and Epileptic type pass on an average more than the normal amount of urine daily, while the Senile, adolescent and demented types pass less than the normal on an average daily.

When we try to explain the reason why the maniacal type passes on an average more urine daily than the demented, we

pass into the region of conjecture.
There are certain plausible things that
suggest themselves to the mind.
We know that in the maniacal type,
the reflexes – at any rate the mental
ones are exaggerated. There is, so to
speak, excessive action every where in
the body. We notice how readily
the saliva gathers in the mouth of
a patient of a maniacal type. ~~of patient~~.
Again, in dementia, we are dealing
so to speak with the negative
side of life. There is a loss and
atrophy of brain substance: the
reflexes – at any rate the mental
set blunted and it is not difficult
to conceive that there will be
and most probably is a torpor of
the functions of the organs of the
body, particularly in the circulation
of the blood. – Witness the cold-
ness and lividity of the hands of
demented patients in cold weather.
These considerations then perhaps

throws some light on the point. There is no doubt that there is considerable vaso motor disturbance in Epilepsy. This is often seen before fits, when epileptics frequently pass considerable quantities of pale urine. Again, Epileptics are highly "nervous" patients, easily thrown off their balance, and frequently dilettanti in their habits. In patients who suffer from frequently recurring convulsive seizures, I have found the knee jerks almost always greatly exaggerated. There is a great instability of the nervous system and their muscles are often stammering like their tongues and I should like to draw attention here to the frequency with which many Epileptics jump to their feet in ordinary conversation, gesticulate a good deal with their hand and keep poking one in the ribs with their right fore finger. This

latter phenomenon is true of the most of the confirmed Epileptic lunatics, but not all of them.

The Senile type of lunatic is one in whom degenerative processes are at work: while in the adolescent the question perhaps is more one of age and a growing body.

In all questions about the daily amount of urine passed, & And still more at the different periods of the day considerable latitude must be allowed. The following table will illustrate this point.

Showing the lowest and highest quantities of urine passed at the different Periods of the day.

Types	6 A.M. Lowest	6 A.M. Highest	8 P.M. Lowest	8 P.M. Highest	Total Lowest	Total Highest
Adolescent	6 oz	47 oz	8 oz	x 130 oz	22 oz	x 150 oz
Demented	7 "	54 "	7 "	49 "	23 "	78 "
Melancholic	5 "	50 "	11 "	35 "	36 "	72 "
Maniacal	20 "	62 "	10 "	55 "	48 "	93 "
Epileptic	18 "	47 "	10 "	72 "	28 "	109 "
General Paralytic	12 "	59 "	6 "	32 "	26 "	79 "
Senile	15 "	35 "	14 "	35 "	40 "	60 "

x the urine of a patient who drank large quantities of water during the day.

From the above table, we observe the greatest discrepancies occurred in the night urine (6 A.M.) among the demented and General paralytics, and in the day urine (8 P.M.) among the adolescent and epileptic and in the 24 hrs. urine also among the adolescent and epileptic. Further we notice the lowest amount of night urine (6 A.M) was passed by a melancholic 5 oz; while the highest amount of night urine 62 oz was passed by a maniacal type. Again, in the day ~~Am~~ urine (8 P.M.), the lowest 6 oz was passed by a General paralytic; the highest 130 by an adolescent. Lastly in the 24 hrs. urine lowest 22 oz — adolescent; highest 150 — adolescent.

Lastly, when we study the individual variations of urine passed from day to day, we find striking discrepancies. An Examination of the Quantity-tables gives the results of

4 adolescents.
8 Demented
1 Melancholic
1 Maniacal
1 General Paralytic
2 Senile

} on three consecutive days.

And, for the sake of showing this point more strikingly, we select a case from each group.

		6 A. M.	8 P. M.	Total
Adolescent	1st day	30 oz	24 oz	54 oz
	2nd day	26 oz	14 oz	40 oz
Demented	1st day	20½ oz	28 oz	48 "
	2nd day	20 "	19 "	39 "
Melancholic	1st day	30 "	26 "	56 "
	2nd day	30 "	23 "	53 "
Maniacal (Patrick C.)	1st day	30 "	34 "	64 "
	2nd day	20 "	28 "	48 "
General-Paralytic	1st day	16 "	30 "	46 "
	2nd day	18 "	30 "	48 "
Senile	1st day	35 "	14	49 "
	2nd day	35 "	17	52 "

The greatest individual variations on two consecutive days among 4 adolescents and 8 dements are here given. *X*

	6 A. M.	8 P. M.	Total
Adolescent	$\frac{16}{30}$ 14 oz	$\frac{14}{30}$ 16 oz	$\frac{54}{40}$ 14 oz
Demented	25 oz	18 oz	15 oz

X See quantity tables.

Likewise, the lowest individual variations.

	6 A.M.	8 A.M.	Total
Adolescent	2	3	3
Demented	0	2	3

All these facts proves that the amount of urine excreted by the kidneys daily or at definite periods of the day is seldom or never a fixed quantity, but varies almost incessantly, within certain limits no doubt in health. The kidneys form with the skin the great sluice-gates of the body to regulate the balance of the circulation by the amount of fluid excreted according to the need of the body. Disease probably sets in, if these sluice gates are seriously disturbed.

II

The Specific Gravity of the urine.

To determine the specific gravity of the urine of lunatics, I examined 200 night urines, and 50 day urines. The results are here appended, and arranged in groups of ten to facilitate their study.

Table 1. of specific gravities of night-urines.

	I	II	III	IV
A	1032	1030	1032	1022
	1030	1025	1022	1030
	1024	1025	1012	1024
	1025	1016	1032	1024
	1032	1022	1032	1022
	1035	1032	1032	1028
	1025	1026	1032	1030
	1018	1022	1014	1024
	1030	1018	1016	1022
	1034	1022	1016	1025

Specific Gravities of night-urines.

	1015	1022	1016	1020
	1020	1022	1012	1032
	1030	1022	1012	1034
A.	1034	1016	1035	1020
V	1034	VI 1024	VII 1035	VIII 1030
	1022	1032	1020	1026
	1032	1028	1022	1020
	1030	1032	1020	1024
	1026	1022	1034	1016
	1026	1032	1020	1026

			B	
	1022	1030	1012	1025
A.	1030	1023	1026	1012
	1035	1020	1025	1015
IX	1020	X. 1022	I. 1014	II. 1032
	1012	1020	1024	1032
	1022	1025	1022	1022
	1030	1030	1032	1032
	1015	1034	1025	1030
	1038	1030	1032	1030
	1030	1034	1015	1030

Specific gravities of night-urines.

	1008	1026	1025	1025	1024
	1016	1015	1020	1022	1024
	1022	1030	1010	1022	1034
B	(III) 1010	(IV) 1030	(IV) 1032	(V) 1018	(II) 1024
	1024	1032	1025	C. 1022	1020
	1022	1032	1032	1022	1025
	1012	1034	1024	1030	1040
	1015	1030	1030	1028	1025
	1030	1030	1026	1015	1030
	1032	1022	1012	1032	1028

C.

1030	1022	1015
1024	1028	1022
(III) 1030	(IV) 1015	(V) 1028
1022	1015	1028
1020	1024	1022
1018	1018	1024
1025	1020	1018
1015	1018	1024
1020	1022	1034
1014	1015	1022.

Table 2. Specific gravities of day-urines

F.

(I)	(II)	(III)
1018	1024	1025
1034	1022	1020
1022	1025	1023
1032	1025	1016
1020	1032	1022
1020	1022	1022
1022	1010	1016
1020	1022	1020
1022	1015	1020
1023	1014	1025

D.

(IV)	(V)
1025	1018
1024	1028
1022	1025
1032	1030
1030	1014
1024	1030
1025	1020
1034	1022
1022	1025
1022	1025

Analysis of the Specific gravity-tables.

Table 3.

A	First 100 cases	mean average =	1025 (1025.2)
Night B.	Next 50 cases	" " =	1024 (1023.9)
C.	Next 50 cases	" " =	1023 (1022.9)
Day D.	50 day-urines	" " =	1023.1
	Mean average of 200 urines { night / day }	=	1024 (1023.8)

From the above Table, we see that the night-urine has a higher specific gravity than the day-urine, and that the mean of the four groups A. B. C. D. is comparatively high 1024.

An Analysis of the different groups of specific gravities brings out some interesting results.

Table 4 showing the percentage in the different groups of the specific gravities ranging from 1020 & under, to 1030 and over.

	Night Urine			Day Urine
	A	B	C	D
1020 and under	26%	28%	36%	30%
1021 - 1025	29	26	42	52
1026 - 1030	20	24	14	8
over 1030	25	22	8	10

Table 4 may be summerised as follows:—

	Night-urine.	Day-urine.
1020 & under	30%	30%
1021 - 1025	32·3%	52%
1026 - 1030	19·3%	8%
over 1030	18·3%	10%

From the above tables, we learn that about 2/3 of night urines have a specific gravity = 1020 - 1035, and that about 4/5 of day urines range from 1015 - 1025.

From which, we may father it is more suspicious if a night-urine has a much specific gravity under 1020 than a day urine; and more suspicious if

a day-urine has a specific gravity much over 1030 than a night-urine.

Diet has a considerable influence over the specific gravity of the urine. The breakfast and tea of the patients being the same from day to day, I was able to take advantage of the alterations in the dinner, in their bearing on the specific gravity. The following are a list of specific gravities after a fish and a list after a beef dinner.

Table 5.

Fish Dinner.			Beef Dinner.		
1016	1030	1022	1032	1030	1025
1022	1024	1016	1030	1025	1015
1032	1034	1024	1024	1025	1020
1026	1022	1032	1025	1032	1030
1022	1032	1022	1032	1022	1034
1018	1030	1020	1035	1012	1034
1024	1026	1034	1025	1032	1020
1024	1026	1020	1018	1032	1030
1022	1022	1020	1030	1032	1026
1028	1022	1032	1034	1022	1020

An analysis of Table 5. brings out the interesting result that the mean average specific gravity of 30 night urines after a Fish Dinner = 1025·4
" " Beef Dinner = 1026·7
That is to say that in a series of 30 night urines, there is found to be a difference of 1·3.
It must be remembered in this connection that the series of urines after fish were totally distinct from that after beef-dinners and that the results would probably be still more decided had the urine in each pint belonged to the same patient.
If, then, it be true in a general way, that beef raises the specific gravity of the urine, then the lesson naturally follows of substituting fish for beef in the diet of those patients whose kidneys are suffering from over-work. It may be here mentioned the fish in the text refers to white fish and herring.

The presence of oxalates (octahedral crystals of oxalate of lime) in the urine seems to have a marked influence in raising its specific gravity or, at any rate, ~~are~~ is in general associated with a high specific gravity of the urine

Table 6. Showing the specific gravity of 40 urines containing oxalate of lime crystals.

1030	1024	1030	1030
1034	1032	1034	1032
1032	1012	1025	1026
1022	1035	1025	1030
1032	1022	1032	1032
1032	1020	1030	1034
1030	1034	1008	1030
1034	1026	1022	1032
1034	1035	1024	1024
1032	1030	1022	1030

The mean average specific gravity of these 40 urines = 1028·14, whereas of 200 urines including the above 40 and other 160, the mean specific

gravity was found to be 1024., affording a somewhat convincing proof that the presence of oxalate of lime crystals in the urine is associated with a high specific gravity as a rule.

The study of the specific gravity is not only interesting, but of great clinical value. We are able to form an adequate conception of its variations in presumably healthy kidneys, and in night urine as compared with day urine, and its data help us to detect how far the kidneys are crippled, as well as suggesting the presence of noxious substances in the urine, one of which undoubtedly is the presence of the crystals of oxalate of lime in the urine, as a habitual occurrence.

The specific gravity of the urine depends primarily no doubt on the relation of the solids to the liquid constituents

in the urine, but the fundamental source is to be traced in the wear and tear of the body, and this wear and tear, in my opinion, influences the specific gravity chiefly. Food and drink also have a marked influence. The specific gravity fluctuates a good deal from day to day and at different periods of the day, in this respect resembling the quantity of urine passed.

I have not been able to trace any connection between the specific gravity of the urine and the different forms of mental disease. In general paralytics, however, when the kidneys are distinctly cirrhotic, the specific gravity tends to become low.

Notwithstanding, the frequency with which the specific gravity exceed 1030, and even reached in one patient 1038, I have not been able to discover the presence of sugar, which might account partially or wholly for the high

range.
Not infrequently, very careful testing of the urine of lunatics will reveal very faint traces of sugar in the urine, particularly after fits in Epileptics, but these fractional-traces of sugar do not amount to a real glycosuria. Nor have I been able to trace in adult men, any particular relationship between the specific gravity of the urine and the body-weight, or between the specific gravity and the age of the individual, provided there are no other distorting conditions. From which, I conclude, the chief factors of the specific gravity are the condition and activity of the renal structures, the wear and tear of the body and to a considerable extent the quality of food, particularly in relation to the amount of ~~nit~~ nitrogenous food taken. The immediate proximate factor being the relation of fluid to solids in the urine.

III Oxalates & Phosphates &c

The presence of oxalates in the shape of a deposit of octahedral crystals of oxalate of lime is of very frequent occurrence in the urine.

Of 150 night-urines examined carefully by the microscope, I found the crystals present in 41 cases.

The following table is taken from a very able paper on oxaluria by Dunlop*, and gives the percentage, according to the different authorities, of oxalates in the urine.

Walshe	28%
Gallois	36%
Baron	41%
Snoler	37%
Dunlop	35%
Maclachlan	27.3%

And I can scarcely refrain from adding my results

The oxalate crystals were found in abundance in 14 cases or 9%.

I may say it was invariably the octahedral crystals that were discovered.

* Excretion of oxalic acid in urine. Journal of Pathology, Jan 1896.

The association of a high specific gravity of the urine with oxalates in the urine has already been discussed.

Oxaluria of a persistent character has been described as a clinical entity by Begbie, and he pointed out the various dyspeptic and so-called nervous or hypochondriacal symptoms connected therewith.

Of the truth of Begbies description, I have no doubt; but what I contend for is that the nervous element may be the consequence of the oxaluria but is not the cause of it. This cause I believe is to be found in the digestive disturbance, and Dunlop has given good reasons for believing that it is connected with a form of hyper-acid dyspepsia.

Clinically, we know certain articles of food are very prone to provoke the appearance of oxalate crystals in the urine, amounting to a decided Oxaluria, if the said articles be

persisted in. Rhubarb, especially in the shape of a sweet preserve, is specially obnoxious in this manner, and the rhubarb-preserve will have to be withdrawn from the diet, before certain vague and uneasy sensations of the patient are dispelled. Besides, as will be adverted to further on, I have good ground for believing that the persistent presence of oxalate-crystals, and under certain conditions, in the urine, will occasion at times such an amount of kidney-irritation as to induce the presence of fine casts of the tubules of the kidney in the urine. In this connection, it is remarkable to find that Dunlop states that on a pure milk diet sufficiently long continued, the excretion of oxalic acid in the urine ceases.

For several years, I have had the conviction that the nitrogenous ~~to~~ articles of diet have very

little to do with the production of oxaluria, but that the saccharine, chiefly, and the farinaceous were ~~chiefly~~ at fault, and these again only under certains conditions of digestion. Of course, foods containing a good deal of oxalate or rather oxalic acid will be all the more potent in this way. I have analysed the diet of 49 patients in whom, oxalates * were found in the urine. The tea and breakfast remained the same in each case.

Number of Patients	Dinner	Result in "oxalurias"	Ratio
(a) 16	Broth, Beef & Suet dumpling	5	3 1/5 : 1
(b) 42	Broth, Beef & Potatoes	16	2 5/8 : 1
(c) 31	Rice Soup, Beef & Potatoes	12	2 7/12 : 1
(d) 7	Rice Soup & Rhubarb Tart	3	2 1/3 : 1
(e) 25	Fish, Potatoes & Suet dumpling	6	4 1/5 : 1
(f) 20	Potato Meat-Soup & dumpling	4	5 : 1
(g) 8	Corned beef & dumpling	3	2 2/3 : 1

Percentage would have been

* oxalates in the form of a deposit clearer of oxalate of lime crystals.

From the above table, we gather presumptive evidence that Rhubarb, Broth, and Rice seem more provocative of the appearance of oxalate of lime crystals in the urine than Fish, Potatoes and Suet dumpling. Nevertheless, while diet has a decided influence over oxaluria, still the main factor is not explained thereby. I believe fermentative dyspepsia to supply that factor, and that the acute oxaluria yields best to a more or less nitrogenous diet, with remedies to check dyspeptic fermentation. The use of alkalies however gets rid of the trouble temporarily. The question arises has oxaluria any connection with the different forms of mental disease. I am inclined to think that there is little or no connection.

The following table shows an analysis of 36 patients, in whose urine the crystals were found.

	Melancholic type.	Maniacal type	Demented
A. Slight	7	8	7
B. Pronounced	3	5	6

Again with regard to age, from adolescence to advanced years, I can only say I analysed 32 cases and found the following result.

32 Cases.

11	15	6
19 - 28 years	30 - 39 years	40 - 50 years

So that in this particular instance, the majority of cases occurred between the age of 30 - 39 years.

At any rate, I am safe in saying, it is remarkable, how infrequently I have discovered oxalate of lime crystals in patients over 60.

IX. This part of the thesis is founded on an entire misconception.
The falling of a cloud of earthy phosphates on heating is no evidence at all of their being in excess.

WB

Excess of Phosphates in the Urine.

This excess of phosphates in the urine is clinically revealed when a cloud falls down on heating urine, which is dispelled by the addition of a few drops of a mineral acid. In 150 cases fresh-urine examined, I found such an excess in 23 cases or about 15%. The urine on each occasion was found to be faintly or very faintly acid in reaction and, in several instances, not-acid in reaction.

An analysis of the 23 cases brought out the following:-

Type of Insanity	
Melancholic	2
Epileptic	2
Maniacal	4
Idiocy	3
Demented	12

X Certainly not

So that excess of phosphates in the urine was found most frequently in Dementia. Next in patients of the Maniacal type.

And we may perhaps safely conclude that where we have got a death or loss in the brain cells, there shall we find excess of phosphates in the urine occurring most frequently. Lastly in regard to the question of age, the following is the result of an analysis of the 23 cases.

Age	No
under 20 years	= 1
20 - 29 "	= 7
34 - 37 "	= 4
51 & 51 "	= 2
64 - 67 "	= 3
72, & 75 "	= 2
40 - 45 "	= 4

From the above table, we observe the majority of cases to have occurred

between the ages of 20 - 30 years, so that there is considerable evidence for entertaining a belief that excess of phosphates in the urine is most apt to occur in young adults, whose brains are retrogressing with dementia.

Uric Acid Crystals in the urine.

These crystals were present only in ~~the~~ the urine of 3 patients out of the 150 cases, and presented the typical lozenge or barrel-staves appearance. There were no other remarkable features about these urines, the Specific gravities being 1025, 1024, 1032. Perhaps the rarity of the occurrence of these uric acid crystals in the urine of the 150 patients was an eloquent tribute to the non-fouty character of the diet, so far as danger in excess of nitrogenous food was concerned.

The presence of Seminal fluid in the urine.

Seminal granules, and corpuscles and Spermatozoa were occasionally found in the urinary deposits, and even in the urine of patients considerably advanced in years. Their presence in the urine was brought about in the vast majority of cases by the vicious habit of Masturbation. The bearing of these in the urine on albuminuria is discussed in another article.

In almost all instances, the urinary deposit consisted to a large extent of mucous, Epithelial cells and debris, and it seemed to me to be as a rule more copious in those urines containing many oxalate of lime crystals.

The presence of Albumen in the urine of the Insane.

In order to detect the presence of albumen in the urine of the insane, I examined 150 night-urines, and 50 day-urines. The tests employed were.—

(1) a saturated solution of picric Acid
(2) Nitric acid
(3) Boiling with delicate acidulation.

(1) & (2) were added to the urine by a pipette and used by the contact method (3)— the heat test was employed in this wise.— 2/3 of a test tube was filled with urine, and the upper part briskly boiled; if no result, a few drops of dilute acetic acid were added to the urine, and the urine boiled briskly once more for a few moments. This latter precaution was found necessary in several instances. In all cases, the test-tube was carefully shaded against a dark back-ground.

There is no doubt that a delicate trace of albumen in the urine can be discovered by delicate tests in a great number of individuals. Some authorities go so far as to assert that a trace of albumen exists in every normal urine, but my experience is against this view, so far as the tests picric acid, heat with delicate acidulation and HNO_3 are concerned. And Grainger Stewart gives the weight of his great authority against such a view.

The following is a list, compiled from Grainger Stewarts work on albuminuria, showing the results as given by various authorities.

Table. - Showing percentage of albuminuria by various authorities.

Chateaubourg	84%	in healthy subjects
Capitan	44·9	Soldiers
Leube	4·16	Soldiers
Noorden	3 — 35	Soldiers
Munn	10·9	applicants for life insurance
Leroux	5·76	Children
Grainger Stewart	32·8	Presumably healthy individuals.

The following table gives my results of 150 night-urines and 50 day-urines.

	Urines examined	Albumen shown by Picric Acid	Albumen shown by Heat with delicate acidulation	Albumen shown by HNO_3
Night-	150	88	47	9
Day	50	21	4	1
		or in	percentage	
Night-		58.6	31.3	6
Day		42	8	2

If we exclude the results by picric acid on account of certain fallacies apt to arise e.g. the fact of it giving a pr. action with mucin, then we may say that a trace of albumen was found in 31.3 per cent of night urines (Heat-test) and in 8 per cent of day-urines.
It will be at once observed how much more delicate a test is heat with delicate acidulation over HNO_3 in the cold, indicated clinically from the above table as being 4-5 times more sensitive to the presence of albumen in the urine, and again of the superiority in this

respect of picric acid over the heat test. Grainger Stewart* has found that in diluting a certain albuminous urine with healthy urine, HNO_3 still showed an albuminous reaction, when the urine was diluted 50 times; heat with delicate acidulation 500, and picric acid 1000, so that he concluded their relative value in this way. —

		Albumen
Picric acid will detect	.000655 gr	— 1/3
Heat & acidulation	.00131 gr	— 1/1
HNO_3	.01311 gr	— 1/1

We thus see what fractional amounts of albumen in the urine, these tests will reveal if carefully used. It is necessary to state here, that the test tube must be delicately shaded, to detect such fine reactions. Consequently in the hands of different investigators such an enquiry as the presence of albumen in the urine will bring out widely different results, according to what is or what is not a doubtful haze or opalescence.

* work on Albuminuria p. 40

I re-examined 50 night-urines ~~that~~ shower a reaction with picric acid with the result that a reaction was found in 42 urines with the same test.

In my experience, therefore, I have found an albuminous reaction with picric acid in 40–60 per cent of urines, but as stated above the test is open to certain fallacies.

The heat test with delicate acidulation will reveal in the same delicate way from 8–30 per cent.

HNO_3 in the cold does not discover those requirements in the urine and has only, in my experience shown an albuminous reaction in 2-6 per cent of urines.

But the vast majority of all these reactions here tabled would not have been detected, unless the test tube had been delicately shaded, against a dark back ground, or that if one had not been looking for fractional traces of albumen, he would not have

found them in the great majority of instances. Clinically, these urines, then, would have been considered normal, and I believe such a view would be safe and sound, for I incline to the opinion that such minute traces of albumen can to a large extent be accounted for by the Epithelial cells, leucocytes or mucous corpuscles, that form the so-called mucous deposit of healthy urine. Indeed, Grainger Stewart recognising the difficulties attending the picric acid as a test for albumen in the urine says "Its precipitate with mucin is, even when applied by the contact method a slight, slowly developed haze. A precipitate in directing albumen is most marked and more quickly produced." * It is difficult to lay down rules for guidance in what amount of reaction with picric acid and heat-test shall be deemed insignificant and of no consequence.

The following statements are perhaps

* page 8 - work on albuminuria

near the Acute.

1. Distinct junction bands, readily seen in diffuse light and forming immediately on the addition of the picric-acid-Solution, indicate an amount of albumen that is abnormal.

2. Delicate hazes, seen only on delicate shading of the tube against a dark background occur in at least 40. 60 per. cent of urines with picric acid test and are in my opinion of no practical importance. Many of these hazes are dispersed by boiling, and reappear again on the cooling of the test-tube. Such hazes are, as a rule, not detectable by the heat-test.

3. Then we have a group of reactions with picric acid, that do not amount to bands and are something more than hazes. They may be described as delicate ring-Opalescence and require shading of the test-tube to be properly appreciated. This group of reactions can generally be verified

with the heat and delicate acidulation test, if the test tube be shaded, and a few moments be allowed to elapse. Here again, the albumen is of such a fractional character as to lose significance.

4. When urine gives an unequivocal opalescence with the heat test, becoming more distinct on the addition of acetic acid, we are dealing with urine that can be held to be normal.

5. Any albuminous reaction with HNO_3 is abnormal.

Table - Showing clinical value of Picric acid, Heat, & HNO_3 tests.

Urine	With Picric Acid	With Heat & Acetic Acid	With HNO_3
(1)	Hazes seen on shading only	neg:	neg:
(2)	Delicate rings of opalescence seen best on careful shading	just appreciable as a fine milky haze on shading test tube	neg:
(3)	Distinct precipitation band	appreciable	appreciable

(1) & (2) cannot be estimated by an Esbach tube, as they form simply a granular layer at the bottom of the tube.

Cause of the fractional amount of Albumen present in many urines

Those traces of albumen revealed by the picric acid test only are perhaps due in the majority of cases to the animal matter suspended in the urine i.e. mucous corpuscles, mucous strands, epithelial cells and debris, and are found present in the urine in my experience of 58 per cent of night-urine 42 per cent of day urine. I believe the night-urine as a rule deposits more mucous on standing than the day-urine and this may account for the greater per centage of night-urine-reactions. Traces of albumen more decided than those above described that are detectable by the picric acid test, and also appreciable with the heat test are more difficult to account for. The difficult point

to decide is where Physiology ends and Pathology begins. Probably here again the majority of these reactions are to be accounted for by the suspended matters in urine as above explained. Some of them again perhaps indicate a slightly imperfect balance in the renal circulation, not amounting to an active inflammatory process, but rather a weakness in the Capillaries of the Kidney, induced by anaemia, valvular disease of heart, or Masturbation or an atheromatous condition of the vessels, all the more potent if co-existing with an enlarged left Ventricle, or the strain of convulsive seizures or acute maniacal outbreaks. The erratic character of this type of delicate albuminuria would point to conditions outside the Kidney. Masturbation is a cause of slight traces of albumen in the urine, which is generally detectable with the ~~pic~~ picric acid test, frequently with the heat test, but seldom with the HNO_3 ~~test~~ in my experience. The albuminuria

may be due to the urine be admixed with Seminal fluid, or indirectly with a Vaso motor disturbance, induced by the vice of masturbation or both conditions may be at work. However I have examined the urine of confirmed masturbators, and have occasionally failed to discover the slightest trace of albumen in the urine, notwithstanding the presence of a few Spermatozoa, but undoubtedly this is the exception to the rule. Lastly traces of albumen in the urine discoverable with HNO_3 test are in my opinion abnormal and indicate an unnatural condition of the renal structures, or the renal circulation, or irritants acting on the kidney, all of which conditions may be temporary or of permanent operation. The following table gives a list of patients, whose urine gave a faint albuminous reaction with HNO_3, but at some subsequent examination failed to do so.

Table - Showing a list of patients whose urine showed an albuminous reaction with HNO_3.

Patients	Sp. Gr. of urine	Albumen	Age	Remarks
1 John S. 1.	1025	Trace	67	
2 Sam: S 2	1025	Trace	51	Had a severe attack of phlegmonous Erysipelas
3 Alex: B. 3	1030	Trace	50	Recurrent attack of Mania.
4 Arch: A. 4	1022	Trace	57	
5 David S 5	1022	Trace	70	
6 Christop: K 6	1016	Trace	60	Hyaline casts found in urine.
7 John G. 7	1022	Trace	36	after Epileptic seizures.
8 Robert B. 8	1032	Trace	37	Maniacal Attack
9 Robert M. 9	1026	Trace	about 50	Masturbator
10 John B. 10.	1030	Trace	25	Masturbator.

Now the remarkable thing about the above list, was that at a subsequent examination the urine failed in each case to react to HNO_3.

Case 2, 3, & 8 are intelligible on the ground of the temporary disturbance in the kidneys induced by respectively Erysipelas & maniacal excitement in Case 3. & 8. It is worthy of note that Case 6 had no casts in the urine at the subsequent examination, but that

Some oxalate of lime crystals were found. The following table gives a list of somewhat anomalous cases: —

trace = trace of Albumen in the urine: Neg = no Albumen.

	Sp. Gr.	Picric Acid	Heat	HNO_3	Microscope
John (1) McC. (General paralytic)	1022	neg.	neg.	neg.	Epithelial cells. and mucous corpuscles
	1012	neg.	neg.	neg.	
Joseph (2) M. (valvular disease of heart)	1022	neg.	neg	neg	" "
	1022	trace	trace	neg	Hyaline Casts Oxalates.
	1018	trace	trace	trace	no casts found.
J. B. (3) H. (valvular disease of heart.)	1032	trace	trace	neg	urates & a few scales.
Gavin (4) M. (Anaemia & Epilepsy)	1024	trace	neg	neg	oxalates & uric acid crystals
	1030	trace	trace	neg	numerous hyaline casts
	1022	trace	neg	neg	neg.

Case (1) John McC. gave no albuminous reaction on two occasions, yet after death the kidneys were found distinctly cirrhotic. The patient died of General Paralysis of the insane

aet: 40, Right Kidney weighed 3½ oz.
Left Kidney " 4 oz
Heart " 10¼ oz.

The Capsule of the left Kidney was found to strip off with difficulty, lacerating slightly the renal structure here & there. There is a fine granular appearance present under the Capsule: proportion of cortex to Medulla = 1:4. Rt Kidney in much the same condition as left. The valves of the heart were competent: Mitral valve thickened: root of the aorta atheromatous & nodules of atheroma on the aortic curtains. This case then would support the belief that the urine of a patient may be free — at all events during 2 examinations — from albumen, and yet the Kidneys be undoubtedly cirrhotic and contracted. On the other hand, the Sp. Gr. 1012 & 1022 were comparatively low for right & urine and might arouse suspicions.

Case (2) & (3) show we may have mitral

incompetence with or without even a delicate trace of albumen in the urine, provided there is no dropsy present. Case (3) shows we may even have hyaline casts, & yet the urine not respond to HNO_3, & contain just the faintest possible amount of albumen.

Case (4) showed hyaline casts in the urine, & yet it did not react to HNO_3.

The patient was decidedly out of health, being very anaemic & subject to frequently recurring epileptic convulsions, which latter may have been the cause of the Kidney State.

Questions of Casts and Oxalates in the urine.

Of the 150 light urines examined carefully by the microscope, casts were found in 9 cases or 6 per cent. These casts belonged to the hyaline variety and some of them were studded over with crystals of oxalate of lime.

Table. - Giving a list of patients, in whose urine hyaline Casts were found & showing the reactions with the different tests.

A.	Sp. Gr.	Picric Acid	Heat & Nitric Acid	HNO_3	Microscope
1. Joseph M.	1022.	trace	trace	neg	Hyaline Casts & oxalates
2. Hugh C.	1032	"	"	"	several casts containing oxalates.
3. John B.	1032	"	"	"	great No of casts containing oxalates
4. Wm. H.	1022	"	"	"	2-3 fine Casts
5. Alex. A.	1030	"	"	"	few Casts
6. John McL.	1026	"	neg.	"	several fine Casts & oxalates.
7. Christ. K.	1016	"	trace	trace	several fine Casts
8. Robert A.	1035	"	"	neg	numerous Casts containing oxalates.
9. Gavin M.	1030	"	"	neg.	numerous Casts.
B.					
1. Joseph M.	1018	trace	neg	neg	Epithelial Scales
2. Hugh C.	1030	neg	neg	neg	Oxalates Chiefly
3. John B.	1040	trace	neg	neg	Oxalates & Epithel. Scales
4. Wm. H.	1025	trace	neg	neg	Epith. Scales
5. Alex. A.	not examined				
6. John McL.	not examined				
7. Christ K.	1020	trace	neg	neg	a few oxalates & Scales
8. Rob. A.	1025	trace	neg	neg	neg
9. Gavin M.	1022	trace	neg	neg.	neg

B. Gives the same list with a subsequent Examination of them made. (several months afterwards)

C. Table showing the physical condition of the above cases.

Name.	Age.	Type of mental disorder.	Condition of heart.
1. Joseph M.	23	Melancholia	Systolic M. at apex. L. V. dilated.
2. Hugh C.	48	Melancholia	1st S. at apex impure. Asthma.
3. John B.	21	Mania	Normal.
4. Wm H.	21	Idiocy	Masturbator. 1st S. at apex impure.
5. Alex A.	75	Dementia	H. S. intermittent, but seem pure.
6. John L.	35	Dementia	Normal.
7. Christ. K	60	General paralysis	L. V. thickened. 2nd sound accentd. Radial atheroma.
8. Robt A.	22	Mania	Normal.
9. Savin M.	25	Epilepsy.	Anaemia.

Explanations of the Casts. — See A.

Case 1. & 9. depended I think on a congested state of the Kidney. Case 7. on cirrhotic state of the Kidney. Case 2. 3. 8, I believe, were due to the irritating effects of oxalate of lime crystals, which existed in great abundance in their urines. Case 4. & 5. I am unable to offer any explanation of. It will be seen from Table A, that a trace of albumen was discovered in each of the 9 cases by picric Acid, i.e. 8 of the 9

by the heat test & in only one by the HNO_3 test, or that we may conclude, hyaline casts may exist in the urine accompanied by such a faint trace of albumen, as to be indistinguishable by the HNO_3 test.

In Table B. we observe ~~that~~ no casts were discovered in any of the urines on this occasion, although a trace of albumen was found in 6 cases and one late in 2 cases. It is noteworthy ~~that~~ in none of the 7 cases, was the albumen present in such a quantity as to be appreciable by the heat test & this fact would lead one to believe ~~that~~ when heat and delicate acidulation fail to detect albumen in the urine, we need not expect to find hyaline casts there or such a condition of the kidney as to create them, and at the same time to observe the great value of Picric Acid as an indicator for closer scanning of the urines. Also the Specific gravity is of importance; thus in Table B. Case ~~(6)~~ (1) 1018, Case (7) 1020; Case (9) 1022. are decidedly low for night urine, & in these cases

I had good reasons for believing their kidneys were not perfectly sound or that the circulation through them was at least temporarily at fault.

The bearing of oxalates on the question of casts in the urine is important. I believe that the oxalates must exist in great numbers, to cause such an amount of kidney-irritation, as to produce casts. It is very interesting to relate that in Cases 2, 3, 8, Table A, the urine contained oxalate of lime crystals in such quantity, that under the microscope many of them were found aggregated together, so as to form microscopical calculi. If the mere presence of oxalates in the urine was sufficient to cause casts, then we would find at least 30 per cent of urines containing casts. Nevertheless I believe that the presence of oxalates in abundance, & under the conditions specified above, in the urine are competent to produce such an amount of kidney irritation as will

be revealed by the discovery of fine hyaline casts containing these crystals. Hence we cannot afford to neglect Oxaluria in regard to the question of physiological albuminuria, within the limits indicated above. I concede there is such a thing; but venture to hazard my opinion that any urine that shows a decided albuminuria with HNO_3 test is distinctly abnormal, although it may not imply serious mischief in the kidneys, but this is a point I am unable to discuss at present.