BRITISH MEDICAL JOURNAL

LONDON SATURDAY MARCH 10 1945

THE INCIDENCE OF PEPTIC ULCER AT ST. THOMAS'S HOSPITAL, 1910–37

BY

Sir HENRY TIDY, D.M., F.R.C.P.

Consulting Physician to St. Thomas's Hospital

Admissions for peptic ulcer to St. Thomas's Hospital between 1910–13 and 1922–37 are here examined to obtain an indication of the trends. The hospital was in military use during the first world war, and records between 1914 and 1921 are not available or not satisfactory. Anastomotic ulcers have not been included, nor have admissions for haemorrhage in which the diagnosis was not established. For the period 1910–13 the accuracy of diagnosis in the living may be doubtful. For the period 1922–37 most diagnoses were confirmed by radiographs, operation, or necropsy.

Periods of four years have been frequently used in order to obtain sufficient numbers for comparison. In 1910–13 admissions for peptic ulcer numbered 463, and in the sixteen years 1922–37 they numbered 3,336 (Table I). There are various methods by which the incidence can be recorded and charted to show the trends. By one method the actual numbers of admissions are compared, and this has the advantage of being easily followed. But accuracy of the trends and the relation of the trends to each other are dependent on the number of beds remaining reasonably constant and being approximately the same for the two sexes. For example, the total number of admissions in 1910–13 was about two-thirds of the later periods. Another method is to record the hospital admission rates—that is, the proportion which admissions for the disease in question bear to the total hospital admissions. This method eliminates differences in the bed complements and numbers of admissions, and also gives an index which can be used for comparison between different hospitals. A difficulty of the method is to decide what admissions should be accepted for the denominator. It was decided here to omit admissions for pregnancy. A second point is that the incidence of peptic ulcer is very low under 20 years of age and total hospital admissions consequently contain a large block of dead weight in this age group. A further point is that the rates for the groups over 40 and under 40 years—the latter practically being between 20 and 40 years—should properly be calculated on the admissions in each age group. Few hospitals would be able to give such figures over a series of years without great labour. At St. Thomas's Hospital they are obtainable fairly easily between the years 1922 and 1929 (Table II). Admissions in the three age groups and for the two sexes do not differ grossly from each other. Hospital admission rates based on these age- and sex-group admissions thus show approximately the same trends and the same relation of the trends as when calculated on the total admissions for each sex, although the resulting index is necessarily different. It was therefore decided not to undertake the labour of counting such admissions. Hospital admission rates therefore, when here used, are calculated on total admissions at all ages for the sex concerned, omitting admissions for pregnancy.

The number of admissions, deaths, and hospital admission rates (H.A.R.) are recorded for four-year periods in Table III, subdivided for gastric ulcer and duodenal ulcer, sex, and age groups under and over 40 years. Annual admissions for males are recorded in Figs. 1 and 2 and for females in Fig. 3. Mean

TABLE I.—*Summary of Admissions for Peptic Ulcer*

	Admissions			Ratio ♂ to ♀
	Total	Male	Female	
1910–13:				
Gastric ulcer	319	114	205	0·6
Duodenal ulcer	144	138	6	23·0
Ratio G.U. to D.U. ..	2·2	0·8	34	(1·2)
1922–37:				
Gastric ulcer	2,189	1,580	609	2·6
Duodenal ulcer	1,147	1,025	122	8·4
Ratio G.U. to D.U. ..	1·9	1·5	5	(3·6)

Ratio of sexes gives the figure for males, regarding females as unity.
Ratio for G.U. and D.U. gives the figure for G.U., regarding D.U. as unity.

TABLE II.—*Annual Admissions by Age and Sex Groups*
(00 omitted. Includes all admissions except for pregnancy)

	Males			Females		
	Age Groups (years)			Age Groups (years)		
	0–20	20–40	40–	0–20	20–40	40–
1922	11	10	12	9	10	11
1923	13	13	13	11	13	12
1924	14	13	14	12	11	13
1925	15	14	14	12	14	14
1926	15	14	15	12	14	14
1927	14	15	15	12	13	14
1928	14	15	16	11	15	15
1929	13	17	17	12	15	16

1910–13: Annual admissions for males about 3,100; for females, about 2,800.
1930–37: Annual admissions for males, range 4,550 to 4,700; for females, range 4,150 to 4,350.

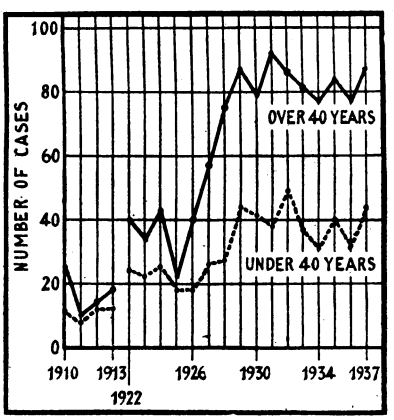

FIG. 1.—Males. Annual admissions for gastric ulcer.

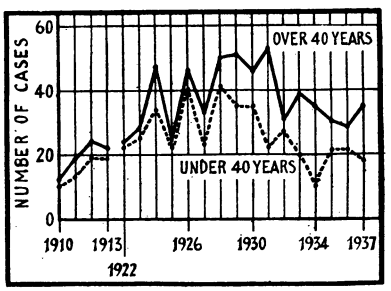

FIG. 2.—Males. Annual admissions for duodenal ulcer.

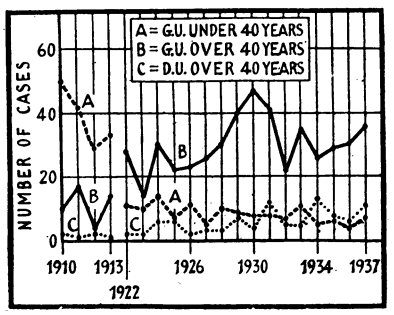

FIG. 3.—Females. Annual admissions for gastric and duodenal ulcer.

TABLE III.—*Peptic Ulcer: Admissions and Deaths*

	Period	Total Admissions	Under 40 Years			Over 40 Years			Hospital Admission Rates	
			Admissions	Deaths	Case Mortality %	Admissions	Deaths	Case Mortality %	Under 40 Years	Over 40 Years
					Males					
Gastric ulcer	1910–13	114	47	9	19	67	16	24·0	0·39	0·54
	1922–25	228	89	8	9	139	27	19·4	0·57	0·90
	1926–29	374	115	4	3·5	259	40	15·0	0·64	1·48
	1930–33	503	165	12	7·2	338	45	13·6	0·89	1·79
	1934–37	475	150	3	2	325	38	11·6	0·80	1·73
	Total 1922–37	1,580	519	27	5·2	1,061	150	14·1		
Duodenal ulcer	1910–13	138	61	9	15	77	27	35·0	0·50	0·62
	1922–25	233	110	7	6·4	123	14	11·5	0·72	0·78
	1926–29	321	140	3	2	181	24	13·0	0·80	1·04
	1930–33	272	103	9	8·8	169	18	11·0	0·55	0·90
	1934–37	199	70	4	6	129	15	11·6	0·38	0·69
	Total 1922–37	1,025	423	23	5·4	602	71	11·8		
					Females					
Gastric ulcer	1910–13	205	160	11	7	45	7	16	1·47	0·43
	1922–25	136	42	2		94	9		0·30	0·67
	1926–29	152	35	1		117	11		0·21	0·74
	1930–33	178	34	2		144	14		0·17	0·73
	1934–37	143	22	—		121	11		0·12	0·67
	Total 1922–37	609	133	5	4	476	45	9		
Duodenal ulcer	1910–13	6	1	—		5	1		0·01	0·04
	1922–25	21	5	—		16	1		0·03	0·11
	1926–29	23	6	—		17	2		0·04	0·10
	1930–33	33	6	3		27	2		0·03	0·14
	1934–37	45	14	1		31	3		0·07	0·16
	Total 1922–37	122	31	4		91	8	9		

Hospital admission rates are expressed as percentages of total admissions at all ages for the sex concerned, excluding pregnancy in females.

hospital admission rates for four-year periods also are recorded in a graph (Fig. 4), and give a general view of the trends over the period.

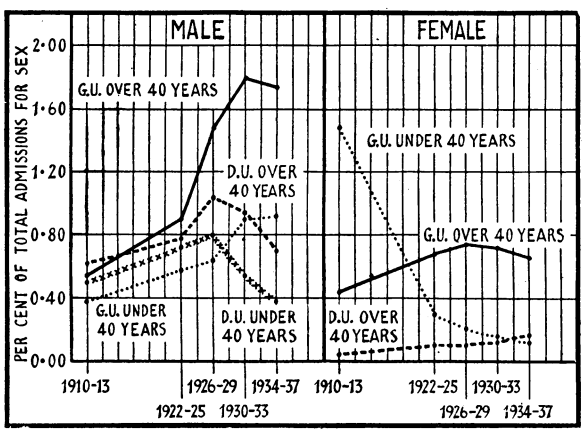

FIG. 4.—Hospital admission rates for peptic ulcer in four-year periods

General Features of the Trends of Admissions

The number of admissions, and the H.A.R. for gastric ulcer in males over 40, rose slowly from 1910–13 to 1922–5. It then rose so rapidly between 1925 or 1926 and 1929 that it more than doubled. Subsequently the rise ceased, but the level was maintained. While the rates for the four groups—viz., G.U. and D.U. under and over 40 years—in males were close together until 1925, this group now far exceeded the others. The trend for gastric ulcer under 40 years is not dissimilar to that for the older group, but the rises are less and the rates on a much lower level; the rise is slight until 1926, but there is then a fairly sharp increase to a maximum in 1929 or 1932, followed by a level rate or possibly a slight fall.

The trends for duodenal ulcer differ from those for gastric ulcer. The trends for the two age groups of D.U. are close together throughout, unlike those for G.U. There is an irregular rise in both age groups to a maximum about 1928–9. Subsequently there is a rapid fall, so that the H.A.R. in 1934–7 for the age group over 40 is only slightly higher than in 1910–13, while for the group under 40 it is definitely lower.

For females there is a spectacular fall in admissions for gastric ulcer under 40 years. While in 1910–13 it was the largest single group of peptic ulcer for either sex, it is now almost extinct. Gastric ulcer over 40 years in women showed a steady rise until 1930, but without the rapid increase seen in males and at a much lower rate. Admissions tended to fall again after 1930. Admissions of females for duodenal ulcer both over and under 40 years are very few. Both age groups show a slight, but only slight, increase. As with males, the rates in the two age groups are close together for D.U. and widely apart for G.U.

There are no other hospital statistics at present by which these results can be checked. They can be compared to some extent for certain periods with the course of the death rates for London (Administrative County), although unfortunately G.U. and D.U. are not separated in the Registrar-General's Returns after 1930 (Tidy, 1944). The death rates for London show a very sharp rise for G.U. in males over 40 years from about 1921, the rate being more than doubled by 1930 (Fig. 5). The death rate for D.U. also doubled in this period, but was throughout about half that for G.U. The rate for G.U. was still rising up to 1930, but the rate for D.U. ceased to rise after 1928. Subsequent to 1930 the combined death rate for G.U. and D.U. in this age group suddenly ceased to rise and became almost stationary.

Deaths for males under 40 years for both G.U. and D.U. are small in number, but the rate showed a slight increase for each between 1921 and 1930, then fell again, and the combined rate was the same in 1937 as in 1921.

For females, the death rate for G.U. under 40 years had fallen rapidly for several decades and was still falling in 1930. For G.U. over 40 years the rate rose 50% between 1921 and 1930. After 1930 the combined rate for G.U. and D.U. in this age group is stationary; as deaths from D.U. are almost negligible, the combined rate is practically due to G.U., which therefore could not have been rising. Thus death rates and admissions after the war both show a rapid rise for males over 40 years, which suddenly ceased about 1930. The rise and the rates in both are much greater for G.U. than for D.U., and the rise stopped earlier for D.U. than for G.U. Both death

rates and admissions show a 50% rise from gastric ulcer in females over 40 years, ceasing in 1930, which does not appear in the death rates for England as a whole or for Scotland. The fall in females under 40 years is common to the whole of Britain for several decades, the most rapid fall being between 1900 and 1920. Thus where the trends of the death rates for

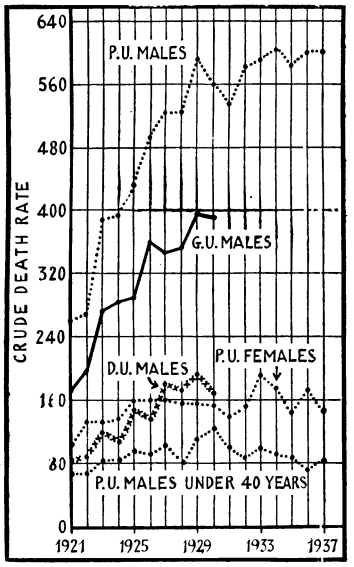

FIG. 5.—London (A.C.). Crude death rates over 40 years of age. Per million living in age and sex groups

London and of the number of admissions, or of the H.A.R. for St. Thomas's Hospital, can be compared, they are in reasonable agreement. The trend of admissions to the hospital is in closer agreement with the death rates for London than with those for England as a whole.

Ratio of Gastric to Duodenal Ulcer

The ratio has changed considerably in the course of 25 years, and consequently ratios based on a long period of years will be misleading. The ratios of G.U. to D.U. for all admissions in the four-year periods are respectively 2.2, 1.4, 1.5, 2.2, and 2.5 to 1. For the period 1910–13 the ratio was dominated by the prevalence of G.U. in young women, and the subsequent fall in the rate was due to decrease in this group. The later rises are due mainly to increase in G.U. and fall in D.U. in males. The trend of the ratios differs so greatly for the two sexes that these should be considered separately (Table IV).

TABLE IV.—*Ratio of Gastric to Duodenal Ulcer*

	Males			Females			Total Admissions
	All Ages	Under 40 Years	Over 40 Years	All Ages	Under 40 Years	Over 40 Years	
1910–13	0·8	0·8	0·9	34	160	9·0	2·2
1922–25	1·0	0·8	1·1	6·5	8·0	6·0	1·4
1926–29	1·2	0·8	1·4	6·5	6·0	7·0	1·5
1930–33	1·9	1·6	2·0	5·4	5·7	5·3	2·2
1934–37	2·4	2·1	2·5	3·3	1·5	4·0	2·5
Total 1922–37	1·5	1·2	1·7	5·0	5·0	5·2	1·9

1922–37: Females, all ages: $\chi^2 = 9{\cdot}13$, n = 3, P = 0·03. For males, all ages, P is infinitesimal.
Figure of gastric ulcer is recorded, duodenal ulcer being regarded as unity. For numbers see Table III.

The ratio for males also varies with the age, rising progressively with each decade (Table V); but this result is based on the whole period 1922–37, during which various changes have occurred, the sum of which must be accepted with caution.

For the period 1910–13, in addition to the prevalence of G.U. in young women, it is noticeable that D.U. was in excess of G.U. for males in both age groups. For males over 40 years of age G.U. was slightly in excess of D.U. in 1922, and, after several years of equality, permanently became greatly in excess in 1927. For males under 40 years G.U. first and finally became in excess in 1929. An appreciable excess of G.U. over D.U. in males is thus a comparatively recent development in admissions to St. Thomas's Hospital, and the excess is still increasing, the ratios for all ages in the four four-year periods 1922–37 being respectively 1, 1.2, 1.9, and 2.4 to 1. G.U. was gaining over D.U. before 1930 because it was increasing more rapidly, and after 1930 because it was stationary while D.U. was falling.

TABLE V.—*Age Distribution of Peptic Ulcers and Perforations, 1922–37*

Age Group	Total Admissions		Males					Females	
			Ratio G.U.: D.U.	Perforations		Perforations % of Admission		Total Admissions	
	G.U.	D.U.		G.U.	D.U.	G.U.	D.U.	G.U.	D.U.
0–20	4	5	0·8	1	3	—	—	4	2
20–30	143	156	0·9	41	36	29	23	35	11
30–40	382	262	1·5	55	47	14·4	18	94	18
40–50	500	304	1·6	75	56	15	18	193	42
50–60	375	213	1·8	43	41	11·5	20	163	29
60–	176	85	2·1	25	22	14	26	120	20
All ages	1,580	1,025	1·5	240	205	15·2	20	609	122

Ratio of G.U. to D.U.: Figure for G.U. is recorded, D.U. being regarded as unity.

For females, G.U. has always been in excess of D.U., which is rare at any age, but the ratio has fallen from 34 to 1 in 1910–13 to 3.3 to 1 in 1933–6. The fall is principally due to the practical disappearance of G.U. under 40 years, but there may be a slight increase in D.U. Thus the ratio of G.U. to D.U. is rising for males and falling for females in both age groups. These changes are statistically significant.

Ratio of G.U. to D.U. in Private Practice

Physicians in the London area have been puzzled by the discrepancy between the ratios of G.U. and D.U. for private patients and hospital cases. Most physicians would agree that D.U. is considerably commoner than G.U. in consulting practice. There is a tendency to believe that private practice more correctly represents the ratio in the local population, and that for some reason hospital statistics are misleading. This view should not be lightly accepted. There are several factors which affect comparison between the two series.

1. Statistics of private patients are generally drawn from many years of practice, while the larger hospital statistics are usually from a few recent years. The statistics given here show how rapidly the relative incidence of G.U. in males has been rising recently among hospital patients in London.

2. Private patients are mainly drawn from a limited section of the community which falls largely into Social Class I (professional classes, etc.), while hospital patients are nearly all from Class III (skilled workers) to Class V (unskilled workers). The Registrar-General's Decennial Report, 1931, Part 2, gives the standardized mortality ratios for G.U. and D.U. for males of 20 to 65 years for the five social classes (Table VI). For Class I the rate for G.U. is

TABLE VI.—*Standardized Mortality Ratios, Gastric and Duodenal Ulcers*

	Males: Age 20–65 Years				Married Women: Age 35–65 Years
	1921–23		1930–32		1930–32
	G.U.	D.U.	G.U.	D.U.	G.U. and D.U.
Social class I	72	126	55	101	53
,, ,, II	87	109	76	106	98
,, ,, III	96	91	99	99	99
,, ,, IV	105	93	109	93	99
,, ,, V	127	113	127	107	118

From the Registrar-General's Decennial Report, 1931, Part 2.

55% of the expected rate, for Class III 99%, and for Class V 127%. On the other hand, for D.U. there is no appreciable difference between the rates for the different classes. If these results apply also to the living, then D.U. in proportion to G.U. will be nearly twice as high in Class I as in Class V. (It must be noted that the actual ratios of G.U. to D.U. cannot be obtained by comparing the standardized mortality ratios for G.U. and D.U.)

There are other factors which affect comparison of private and hospital patients, such as age and sex distribution, and the areas from which material is drawn. An urban population in England tends to have a higher incidence of G.U. than a rural

area, and hospital patients are, in general, urban residents, while private patients are drawn from wider areas. Hence the ratios of G.U. to D.U. in private practice and hospital patients are not necessarily comparable.

Sex Incidence

The sex incidence differs so greatly for G.U. and D.U. that these should be considered separately. For each ulcer the ratio has changed steadily between 1910 and 1937, but in opposite directions, and the ratio for the two ulcers combined—i.e., for peptic ulcer—is of little value (Table VII). The relative incidence of males has been rising for G.U. and falling for D.U. Both changes are statistically significant. Ratios based on a long period of years may be misleading, and the common statement that the sex incidence remains constant at 3 males to 1 female gives an erroneous impression of constancy of the ratio in the two types of ulcer.

TABLE VII.—*Ratio of Males to Females*

	Gastric Ulcer			Duodenal Ulcer			Peptic Ulcer
	All Ages	Under 40 Years	Over 40 Years	All Ages	Under 40 Years	Over 40 Years	Total Admissions
1910–13	0·6	0·3	1·5	23	61	15	1·2
1922–25	1·7	2	1·5	11	22	8	3
1926–29	2·5	3	2·2	14	23	11	4
1930–33	2·7	5	2·2	8	17	6	3·7
1934–37	3·3	7	2·7	4·5	5	4·3	3·6
Total 1922–37	2·6	3·9	2·2	8·4	14	7	3·6

1922–37: G.U. over 40 years: $\chi^2 = 11{\cdot}47$, n = 3, P = 0·01.
1922–37: D.U. all ages: $\chi^2 = 20{\cdot}30$, n = 3, P = less than 0·01.
Figure for males is recorded, females being regarded as unity. For numbers see Table III

In the period 1910–13 there was little difference between the two sexes for peptic ulcer as a whole. D.U. was practically unknown in females, but in G.U. under 40 years women predominated, and formed the largest of all groups. The excess of females in this group disappeared between 1913 and 1921. The previous preponderance of this group and its rapid fall have influenced sex ratios for the last 50 years, as also the ratios for G.U. and D.U. While this group is now very small, the fall in admissions and in the hospital admission rates can be recognized up to the last period, so presumably a few cases of the same type are still occurring. Since the disappearance of this group, males have been heavily in excess in all groups, especially at younger ages. The rarity of D.U. in women is noticeable. For D.U. under 40 years only 31 women were admitted in 1922–37, in contrast to 423 males.

Age Incidence

In the period 1922–37 admissions were highest in the decade 40–50 years, both for G.U. and D.U. and for both sexes (Table V). For females the proportion of admissions below 40 years is now less than in males, and the average age is higher (see Table II). The average age of admissions for G.U has been increasing in both sexes, but in males it has been mainly due to increasing numbers over 40 years and in females to decreasing numbers under 40 years. General estimates of age incidence based on long periods are of little value, for age incidences have been influenced by two factors which have been rapidly changing during the period under consideration. The most important is the practical extinction of the formerly predominant group of G.U. in young women. In 1910–13 and probably for some years subsequently the size of this group caused the mean age for peptic ulcer to be much lower in women than in men. In previous decades the difference was even greater. The disappearance of this group resulted in peptic ulcer in a short time becoming very rare in young women, causing a rapid rise in the mean age considerably above that for males. The rapid increase in G.U. in males over 40 years, and to a lesser degree in D.U., between 1920–30 raised the mean age for males, but it still remained below that for women.

Incidence of Perforations

In the period 1922-37 admissions for perforated peptic ulcer numbered 478. There were 263 perforations among 2,189 admissions for G.U., forming 12.1%, and 215 among 1,147 admissions for D.U., forming 19.1%. The difference between these percentages is statistically significant (7 ± 1.31). We have no reason to believe that there was selection at any point in favour of perforated D.U. or, conversely, in favour of non-perforated G.U. On the data here available the difference may be held to indicate that D.U. has a greater liability to perforate than G.U. This is in accordance with the general belief of clinicians, but is a provisional suggestion on the present data. The differences between the percentages of perforations to admissions for G.U. and D.U. are significant separately for males (4.8 ± 1.54) and for females (4.4 ± 2.06).

Among males G.U. perforations numbered 240 and D.U. 205, and among females G.U. numbered 23 and D.U. 10. Males constituted 91% of admissions for perforated G.U. and 95% for D.U. This high proportion in males is not wholely accounted for by the greater incidence of peptic ulcer. Perforations form 17% of male admissions and only 4.5% of female. The difference in the percentages between the sexes is statistically significant both for G.U. (11.4 ± 1.55) and for D.U. (11.8 ± 3.74). There is no reason to believe that there was any selection which would influence these results. The difference may be held to indicate that, given an ulcer is present—either G.U. or D.U.—the liability to perforate is greater in a male than in a female.

TABLE VIII.—*Incidence and Mortality of Perforations*

	Period	Under 40 Years				Over 40 Years				Total Perforations
		Perforations		Deaths		Perforations		Deaths		
		No.	% Cases	No.	% Perfns.	No.	% Cases	No.	% Perfns.	
		Males								
Gastric ulcer	1910–13	10	21	3	30	17	25	8	47	27
	1922–25	17	19	1		28	20	10		45
	1926–29	19	17	—		40	15·6	15		59
	1930–33	34	20	6		39	11·5	12		73
	1934–37	27	18	3		36	11·2	12		63
	Total 1922–37	97	18·7	10	10	143	13·5	49	34·3	240
Duodenal ulcer	1910–13	10	16	5	50	43	56	27	63	53
	1922–25	23	20	4		21	17	5		44
	1926–29	27	19	3		46	25	4		73
	1930–33	18	18	7		22	13	7		40
	1934–37	18	26	2		30	23	7		48
	Total 1922–37	86	20·1	16	18·6	119	20	23	19·3	205
		Females								
Gastric ulcer	1910–13	19	12	6	31	7	16	6	90	26
	1922–25	1		—		3		1		4
	1926–29	—		—		4		1		4
	1930–33	2		—		5		2		7
	1934–37	1		—		7		5		8
	Total 1922–37	4		—	—	19	4	9	47	23
Duodenal ulcer	1910–13	—		—		1		1		1
	1922–25	—		—		1		—		1
	1926–29	—		—		—		—		—
	1930–33	2		1		2		1		4
	1934–37	2		—		3		1		5
	Total 1922–37	4	13	1			7	2		10

For number of cases (admissions of ulcers) see Table II.

The highest number of perforations in males was in the age group 40–50 years, both for G.U. and for D.U. (Table V). For females the numbers are too small for subdivision, but perforations are very rare under 40 years.

The proportion of perforations to admissions for males is the same in the two age groups for D.U. For G.U. it is higher under 40 years than over 40 years, and the difference is significant (5.2 ± 1.92). Over 40 years the proportion has apparently been falling. The higher proportion of perforations to admissions under 40 years for G.U. is entirely due to the decade 20–30 years, which is nearly twice as high as any of the succeeding decades, between which the difference is not significant. Nor is the difference significant between any of

the decades for D.U. This uniformity for D.U. throughout life is consistent with other evidences given in this communication. So also is the distinction of G.U. into two age groups, but the indication here suggests that the dividing line is nearer 30 than 40 years.

There were 98 deaths among 445 male perforations, the case mortality at all ages being 22%. For G.U. the rate is 24.6% and for D.U. 19%. For D.U. there is no difference in the case mortality in the age groups. On the other hand, for G.U. there is a marked difference, being 34% in the older group and 10% in the younger, and the difference is statistically significant. A higher case mortality for G.U. perforations than for D.U. is well recognized, and also a rising case mortality with increasing age. The absence of increase for D.U. in the later age group is unexpected, and more data are desirable.

There were 12 deaths in 33 female perforations, only one death occurring under the age of 40 in the 16 years.

For the period 1910–13 perforation has a high case mortality, as would be expected. While statistics at this period must be accepted with caution, the number of perforations from G.U. in women under 40 years may be accepted as substantially correct, since this was a well-recognized lesion. In this group, among 160 admissions, there were 19 perforations with 6 deaths. This is the highest number of perforations in any group of G.U., but they form only 12% of admissions—a proportion lower than any other group. The view often accepted that this type of ulcer had a special tendency to perforate, with a high case mortality, is not supported by these figures. The differences between the groups are not significant. The large number of perforations from D.U. in males over 40 years in this period is noticeable, and the allocation for D.U. apparently is supported by the cases in which necropsies were performed. If this series is reliable a rapid change in the incidence of perforation of D.U. took place between 1913 and 1922 or in the type of ulcer, but although the change is statistically significant, further data are necessary.

Recurrence of Perforation.—For the period 1933–6, of the 392 admissions for G.U. in males, excluding admissions for perforation, 16 had previously perforated, and of 170 similar admissions for D.U. 9 had done so. Of the 70 admissions for perforated G.U. 3 had previously perforated, and of the 38 admissions for perforated D.U. 2 had perforated, none of these being fatal. The proportion of these earlier perforations is about the same in the two groups. No woman had previously perforated.

Duration of Symptoms before Admission

The duration of symptoms in males before admittance has been calculated from admissions to St. Thomas's Hospital for 1933–6 and, in order to obtain additional material, from a number of admissions to Army hospitals in 1941 (Table IX).

TABLE IX.—*Duration of Symptoms Previous to Admission (Males)*

	Age Groups (Years)				
	20–30	30–40	40–50	50–60	Over 60
Gastric ulcer:					
Under 4 years	56 (30)	46 (61	47 (56)	41 (39)	50 (28)
4–9 years	30 (20)	28 (37)	30 (37·	31 (30)	17 (9)
10 years and over ..	10 (7)	26 (34)	23 (27)	38 (27)	33 (18)
Mean duration (years) ..	4½	6	6	6	6
Duodenal ulcer:					
Under 4 years	48 (124)	40 (112)	38 (45)	33 (14)	20 (3)
4–9 years	43 (112)	35 (110)	23 (27)	29 (12)	40 (6)
10 years and over ..	9 (25)	25 (73)	39 (46)	38 (16)	40 (6)
Mean duration (years) ..	4	6	7	7	8

Distribution of duration recorded in percentages for each age group. Actual numbers in brackets. Admissions for perforated ulcers are not included.

For G.U. the duration before admission does not increase after the age of 30. There is a material proportion with a comparatively recent onset even in the later age groups. For D.U. the previous duration tends to increase with age, and there is a higher proportion of lengthy durations and a progressive decrease in the proportion of short histories. It would appear that a high proportion of cases of G.U. met with in the later age decades have started after middle life and that the common course for younger patients is to recover either completely or sufficiently not to require subsequent hospital treatment. This is undoubtedly true for the type of G.U. formerly prevalent in young women.

Deaths and Case Mortality

The causes of death will not be considered here, other than the above references to perforation.

In the period 1922–37 there were 333 deaths in 3,336 admissions—a case mortality of 10% (Table III). The case-mortality rate varies greatly with the age, and to some extent with the type of ulcer and the sex. In the age groups under 40 years the rate is about 5% in each group, while over 40 years it is 12.3%. In women under 40 years only 9 deaths occurred among 164 cases. In the age groups over 40 years the case-mortality rate is higher for males (13.3%) than females (9.5%), and for G.U. (12.8%) than D.U. (11.2%). For males the rate is 14.1% for G.U. and 11.8 for D.U. The difference between males and females is significant (3.8 ± 1.59); the other two are not significant.

Comparing four-year periods, the case-mortality rate from G.U. in males over 40 years has fallen steadily from 19.4% in 1922–5 to 11.6% in 1934–7. The difference between 19.4 and 11.6 is significant (7.8 ± 3.5), but the differences between the four columns are not statistically significant to the χ^2 test. ($\chi^2 = 5.21$, $n = 3$, $P = 0.15$.) This, however, takes no regard for the order of the numbers in a progressive fall. This can be corrected by the formula $\frac{P}{|n+1}$, where n is the number of columns as counted in the χ^2 test. This reduces the value of P from 0.15 to 0.006, which is significant. Hence it appears that the progressive fall is significant. Various reasons could be suggested for this, such as improved surgical and medical treatment. For D.U. there has been no fall in case mortality. The case-mortality rate for 1910–13 is considerably higher than for later periods. The rate for G.U. in females under 40 years is distinctly lower than for other groups, and supports the comparative mildness of this type of ulcer.

Discussion

Any attempt to follow the trend of peptic ulcer must consider G.U. and D.U. separately and also subdivisions for sex and age. The present communication solely applies to the London area. Even with this proviso, admissions to a single teaching hospital are not necessarily a random sample of the area. Until further data are available certain deductions are only provisional. Nevertheless the broader outlines here presented of the picture and of the trends may be useful. In certain groups the trends of the hospital admissions can be compared with the trends of the death rates for London and for England and are not inconsistent.

Two special factors influence the trend of peptic ulcer during the period of 1910–37. One is the rapid decrease of gastric ulcer in young women in the earlier years of the period, and the other is the rapid increase of gastric ulcer in older men between 1922 or 1925 and 1930.

The fall in the incidence of gastric ulcer in young women is confirmed by the trend of death rates for all parts of Britain. The decrease of perforations in this group has long been clinically recognized (Jennings, 1940), but it is evident from the trend of hospital admissions that such decrease is the result of a fall in the incidence of this ulcer and not due to a change in its liability to perforate. The fall for admissions, perforations, and death rates was largely completed by 1922, but still continued until 1937, and it greatly influences all long-period ratios of G.U. to D.U., males to females, and age incidences. This was the largest group of peptic ulcer until about 1914, but its fall probably began about 1900, its incidence in the nineteenth century having been even greater. The disappearance of this group establishes that some set of removable external aetiological factors can rule the incidence of one type of ulcer in one sex at one age period, and if this is true for one group of peptic ulcer it can be true for others. A further question which may be referred to here is the fate of this group of young women. They did not die, since the case mortality is low. Nor did the ulcers become chronic, for

in the period 1910–13 there were 160 admissions under 40 years and only 45 over 40 years, and the young cases were not readmitted for recurrences. The only remaining substantial possibility is that the ulcers healed and did not recur.

A rapid rise in admissions for G.U. in males over 40 years started about 1925 and ceased about 1930, when the curve flattened out. A rapid rise in death rates in this group for all parts of England but greatest in London began about 1922 and ended about 1930. This group, both for admissions to St. Thomas's Hospital and for death rates for London, and also for death rates for England, had then outstripped all other groups of peptic ulcer.

Admissions for G.U. in males under 40 years also rose rapidly between 1925 and 1930, but there are certain differences between the two age groups. The rise is less marked. There is a wide interval between the curves for these age groups. The duration of symptoms previous to admission is comparatively constant throughout the two age groups, and suggests that the older group is not due materially to continuation of symptoms arising in the younger ages, but to new formations of ulcer. This difference between the two age groups for G.U. in males is even more marked in females, in whom the trends are clearly completely independent.

The trends of admissions for D.U. differ from those for G.U. Admissions in males are close together in the two age groups. There is a progressive increase in the duration of symptoms in the age groups, and an increasing proportion of cases with lengthy histories. Admissions for D.U. in males rose irregularly to a maximum about 1928–30. Subsequently there was a fall until the hospital admission rate finally was below that for 1910–13. Admissions commonly exceeded those for G.U. until 1926. The curve for G.U. over 40 years then finally passed the corresponding group and rose far above it. The curve for G.U. under 40 years passed D.U. under 40 years in 1929.

If the trends of admissions to St. Thomas's Hospital are a reflex of trends of morbidity in the population drained they suggest that the incidence of G.U. in males over 40 in the London area rose rapidly about 1925 and suddenly ceased to rise about 1930, though the maximum rate was maintained, while the incidence of D.U. in males rose moderately during a shorter period, but subsequently fell again to the level of 1910–13. Such trends and the recent great and increasing preponderance of G.U. over D.U. may be unexpected, but they are consistent with the trends of the death rates.

For females the only considerable group of peptic ulcer in recent years is gastric ulcer over 40 years of age. Admissions show a steady but moderate increase to a maximum in 1930, with a subsequent fall. This trend agrees with death rates for the London area, but neither England as a whole nor Scotland shows any rise in death rates. All other groups of peptic ulcer are now rare in women. The incidence under 40 years is low, and the mean age, which before 1913 was below that for males, is now higher.

The proportion of cases admitted for perforations varies in different groups. It is suggested that in the absence of evidence of selection a higher proportion indicates a greater liability to perforate. Differences referred to here are all statistically significant. The proportion is higher for D.U. than for G.U. in both age groups. For D.U. the proportion is the same in the two age groups, but for G.U. it is higher under 40 years than over 40 years. The case-mortality rate for all ages is higher for G.U. than for D.U. This is due to the high case mortality for G.U. over 40 years, which is three times greater than in G.U. under 40 years. The case-mortality rate for D.U. in this series is the same in both age groups. These differences between perforations in the two age groups for G.U., together with other differences referred to above, will be held to indicate the presence of different aetiological factors at different ages. For D.U. there are no such differences.

The proportion of cases admitted for perforation is lower in females than in males for both G.U. and D.U. Perforations in women are now rare. Thus it appears that in women not only is the development of ulcer now comparatively rare but, when present, an ulcer has a low liability to perforation. Possibly the factors which determine formation of an ulcer and perforation are not necessarily identical.

It is generally agreed that the aetiological factors of G.U. and of D.U. are different. Clinical evidence for this is accumulating. There are differences in the trends of the death rates for the two types in England and between England and Scotland, and differences in the standardized mortality ratios for the five social classes. Various differences in the two types for admissions, perforations, and case mortalities are recorded here. For G.U. there are also differences between the age groups. It may be suggested that there is more than one group of aetiological factors producing G.U., operating commonly at different ages and differently in the two sexes. For D.U. there are no such differences between the age groups, which suggests that the same set of factors operates at all ages but with widely different effects on males and females.

Psychoneurotic stimuli often appear to be the exciting cause of the development of D.U. and of the incident of perforation. As a sole factor this theory does not explain the rarity of D.U. in women and the even greater rarity of perforation. The severest air raids scarcely shook the curve of perforations in women, but they sent the curve for men sky-high. Nor is it consistent with the practical absence of D.U. before 1900 and its subsequent trends. Some independent predisposing cause is indicated. Psychoneurotic stimuli may pull the trigger, but some other hand has previously loaded the gun.

The external factors concerned in the development of gastric and duodenal ulcer cannot even be adumbrated here, but a study of the changing face of peptic ulcer and of its different aspects in various geographical areas may assist in their elucidation.

Conclusions

1. Admissions for G.U. in males over 40 years increased rapidly between 1925 and 1930, when the rise ceased but the maximum rate was maintained. Admissions under 40 years had a somewhat similar trend, but with much lower numbers. There are certain differences between the features of the two age groups.

2. Admissions for D.U. in males rose irregularly and moderately after the war until 1929–30 and then fell again to the level of 1910–13. Admissions in the two age groups under and over 40 years are similar in number and trends.

3. Admissions for G.U. in males have been in excess of those for D.U. since 1927, previously having been less, and the excess has been rapidly increasing. Under 40 years, G.U. first became in excess of D.U. in 1929.

4. The trends of admissions for G.U. in females are completely independent in the age groups under and over 40 years.

5. Admissions for G.U. in females over 40 years increased moderately until 1929–30, when the rise ceased.

6. Admissions for G.U. in females under 40 years formed the largest group of G.U. in 1910–13, but fell rapidly, and the incidence is now very low.

7. Admissions for women are very low for D.U. at all ages.

8. The trends of hospital admissions and of death rates for London (Administrative County) are reasonably in agreement.

9. The ratio of G.U. to D.U. is rising for males and falling for females.

10. The ratio of males to females is rising for G.U. and falling for D.U.

11. The ratios of G.U. to D.U. in hospital admissions and in private practice are not comparable.

12. The liability of an ulcer to perforate is greater in D.U. than in G.U., and greater in males than in females for both G.U. and D.U. For G.U. the liability is greater under 40 than over 40 years; for D.U. it is the same in both age groups.

13. The case-mortality rate of perforated G.U. is considerably higher over 40 than under 40 years. For D.U. it is the same in both age groups.

14. The factors stimulating the formation of peptic ulcers are different for G.U. and D.U. For G.U. they are not the same for the age groups under and over 40 years. For D.U. they are similar for both age groups, but have little influence on women.

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