# Topics in Gastroenterology 7

edited by
S. C. Truelove
C. P. Willoughby

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EDITED BY

S. C. TRUELOVE

MA, MD, FRCP

AND

C. P. WILLOUGHBY

MA, BM, BCh, MRCP



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# Preface

This book is a written version of the most recent annual Oxford course in postgraduate gastroenterology.

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*Nuffield Department of Clinical Medicine,*
*University of Oxford*

S.C.Truelove
C.P.Willoughby

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# Contributors


DR W. ST. C. FORBES *Department of Radiology, Hope Hospital Salford*

DR N. FOROOZANFAR *Department of Chemical Pathology, Westminster Hospital, London*

DR J. GARCIA PAREDES *Hospital Clinico, Madrid, Spain*

PROFESSOR J. R. HOBBS *Department of Chemical Pathology, Westminster Hospital, London*

SIR FRANCIS AVERY JONES *Central Middlesex Hospital, London*

MR TERENCE KENNEDY *Royal Victoria Hospital, Belfast*

MR S. E. KNIGHT *Surgical Unit, St. Mary's Hospital, London*

PROFESSOR SIR HANS KREBS *Metabolic Research Laboratory, Radcliffe Infirmary, Oxford*

DR J. T. LA BROOY *Department of Medicine, Royal Adelaide Hospital, Adelaide, South Australia*

PROFESSOR M. J. S. LANGMAN *University Department of Therapeutics, City Hospital, Nottingham*

DR PATRICIA LUND *Metabolic Research Laboratory, Radcliffe Infirmary, Oxford*

DR ANDREW MCMICHAEL *Nuffield Department of Surgery, Radcliffe Infirmary, Oxford*

PROFESSOR I. N. MARKS *Gastrointestinal Clinic, Groote Schuur Hospital, Cape Town, South Africa*

PROFESSOR PETER J. MORRIS *Nuffield Department of Surgery, Radcliffe Infirmary, Oxford*

DR BRIDGET M. OGILVIE *The National Institute for Medical Research, Mill Hill, London*

DR D. S. PARSONS *Department of Biochemistry, University of Oxford*

DR C. PIASECKI *Department of Anatomy, Royal Free Hospital School of Medicine, London*

PROFESSOR R. R. PORTER *Department of Biochemistry, University of Oxford*

MR W. E. W. ROEDIGER *Nuffield Department of Medicine, Radcliffe Infirmary, Oxford*

PROFESSOR I. M. ROITT *The Middlesex Hospital Medical School, London*

MR R. C. G. RUSSELL *Department of Surgery, The Middlesex Hospital, London*

PROFESSOR D. J. C. SHEARMAN *Department of Medicine, Royal Adelaide Hospital, Adelaide, South Australia*

MR H. W. STEER *Nuffield Department of Surgery, Radcliffe Infirmary, Oxford*

PROFESSOR KEITH B. TAYLOR *Stanford University Medical Center, Stanford, California, U.S.A.*

MR CHRISTOPHER WASTELL *Department of Surgery, Westminster Hospital, London*

# Peptic Ulcer

# Chapter 1
# Epidemiological aspects

GEOFFREY WATKINSON

Chronic peptic ulcer is a world-wide disease, affecting at any one time up to 10% of the populations of western countries. Its economic effects can be profound, the annual loss of earnings in the United States alone being estimated at over one billion dollars. Peptic ulcer disease therefore presents a public health problem of enormous proportions (Blumenthal, 1968).

Study of the epidemiology of peptic ulcer and its predisposing causes is hindered by many factors (Watkinson, 1961; Langman, 1974). Gastric and duodenal ulcers, obviously different diseases, are often lumped together as one entity. Simple statistical principles are often ignored in the presentation of data, in that sexes are not separated, and the overall prevalence or incidence figure is often quoted without stating the age distribution of the subjects with an ulcer or that of the population at risk. In this chapter, the difficulty of collecting reliable data on the incidence and prevalence of peptic ulcer will be discussed. Some evidence will be produced of the varying frequency throughout the world and within the UK. By studying chronological trends in ulcer occurrence, evidence will be produced to indicate that its frequency is declining and its pattern changing. Possible factors which might be producing these changes will be briefly reviewed.

## Methods of determining ulcer frequency

The methods which have been used to estimate the *prevalence* of ulcer (that is, the proportion of subjects in a given population with an ulcer at a particular point in time) or the *incidence* of ulcer (that is, the

proportion of subjects developing an ulcer during a given period of study) are as follows:

1 Mortality statistics.
2 Necropsy studies.
3 Examination of hospital clinical records of patients with an uncomplicated ulcer or with an ulcer complicated by perforation or bleeding.
4 Studies of ulcer frequency and morbidity in closed communities.
5 Prospective surveys of ulcer frequency in a particular town, region or country, based on the whole population or on a truly random sample of it.

## Mortality statistics

While mortality statistics are recorded centrally and are readily available for study in most civilized countries, they possess serious disadvantages. Only in diseases with a high mortality will these statistics give any reliable estimate of the incidence of a disease. Fatality rates will be affected by the availability and efficacy of treatment in a particular locality and will also be profoundly affected by various racial, environmental, dietary and economic factors. Perhaps the most important limitation of mortality statistics is that they are based on death certificates issued in the normal routine of medical practice; the accuracy of diagnosis may be depressingly low, even in western countries, and varies enormously from country to country.

These limitations are particularly relevant to peptic ulcer, which is not a common cause of death. Only a proportion of ulcer subjects develop a dangerous complication, such as haematemesis or perforation, and even then the mortality seldom exceeds 8%. When death occurs from other causes, the presence of an incidental peptic ulcer is rarely recorded on the death certificate.

Studies of mortality statistics in 1952–4 over-estimated the frequency of ulcer in England and Wales. It appeared that ulcer was three times more common than in Norway, whereas careful population studies showed the prevalence to be strikingly similar (Doll *et al*, 1951; Knutsen and Selvaag, 1947). However, mortality statistics gave the first indication of the dramatic increase of chronic gastric ulcer in young and middle-aged women in Western Australia (Billington, 1960), a finding subsequently confirmed by population studies (Gillies and Skyring, 1969; Piper *et al*, 1977). Langman (1973) and Litton and

Murdoch (1963) used mortality statistics to demonstrate that ulcer frequency varied with socio-economic status, being higher in the lower social classes, particularly in the second period of study (Table 1.1) This trend was confirmed by Pulvertaft in his population surveys in York in 1968.

**Table 1.1.** The social class and mortality of peptic ulcer (Langman, 1973)

| | Social class* | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | V |
| Gastric ulcer | | | | | |
| 1949–51 | 56 | 81 | 97 | 99 | 144† |
| 1959–63 | 46 | 58 | 94 | 106 | 199 |
| Duodenal ulcer | | | | | |
| 1949–51 | 105 | 78 | 106 | 82 | 126 |
| 1959–63 | 70 | 84 | 113 | 102 | 136 |

* Registrar General 1958, 1951.

† Figures are standardized mortality ratios, observed divided by expected rates multiplied by 100.

## Necropsy studies

While, at first sight, necropsy studies have the great merit that the diagnosis can be made with precision, many ulcer scars will be missed unless the pathologist is prepared to examine the stomach and duodenum carefully irrespective of the cause of death. Also, the proportion of patients dying in hospital who are examined *post mortem* is highly variable, and depends largely on the interests of the hospital medical staff. Again, overall figures of ulcer incidence are frequently given which ignore the age and sex distribution of the patients found to have an ulcer and that of the population being studied.

In two autopsy studies, Watkinson (1958, 1961) showed that useful information could be obtained about the incidence of ulcer in the general population, about regional differences and about the association of ulcer with other diseases. In the first study, which was based on 12,640 autopsies conducted at the Leeds General Infirmary between 1930 and 1949, a high proportion (83%) of patients dying in hospital

came to autopsy. Due to the careful supervision of the late Professor Matthew Stewart, a pathologist who had shown a lifelong interest in peptic ulcer, only 1.5% of the records were rejected as being incomplete or inadequate as he had personally examined the stomach and duodenum in every case. In the second study, which was based on the post-mortem findings in 7290 patients who died in hospital, pathologists in 17 hospitals in nine towns in England and Scotland were asked to look prospectively for peptic ulcer to see if there were regional differences. In both surveys, patients with gastric carcinoma were excluded and also patients who had died from burns, which are known to predispose to acute peptic ulceration. Acute, subacute and chronic ulcers in the stomach and duodenum were identified. A distinction was made between ulcers causing death and those found incidentally. All associated pathological findings were noted and the information was stored on punch cards. Ulcer frequency was analysed by sex and age group. Where overall figures of ulcer occurrence were given, suitable corrections were made to allow for the different age distributions of the populations being compared.

The author considered that the best estimate of ulcer frequency in the general population could be obtained by studying the number of active chronic ulcers and ulcer scars found incidentally in the survey in patients dying from other causes. When this was done, the ulcer frequencies were very similar to those found in population surveys being undertaken at the time (Table 1.2).

This prospective survey provided convincing evidence of regional variations in ulcer frequency. Ulcers and scars found incidentally were more common in northern England and in Scotland than in some southerly regions. In Scotland, this difference was most marked in respect of duodenal ulcer in young and middle-aged males (Watkinson, 1958). Evidence that this regional variation persists was confirmed by a study of perforation rates to be discussed later. Further confirmation that this is still so is provided by the regional variations in admission rates for duodenal and gastric ulcer (Brown *et al,* 1976) (Fig. 1.1). Admission rates for duodenal ulcer varied between seven and 16 per 100,000 in seven towns or regions in southern England, the Midlands and Wales, between 22 and 23 per 100,000 at four centres in Yorkshire and Lancashire, rose to 31 per 100,000 in Newcastle and reached 45 per 100,000 in Scotland, a three-to six-fold increase as compared with the south. Admissions for gastric ulcer did not show similar regional variations.

**Table 1.2.** Comparison of percentage estimates of male ulcer frequencies based on population surveys in London† and in York‡ with the number of active ulcers found incidentally at necropsy in Leeds* after deaths from ulcer have been excluded that might well have been symptomatic in life

| | Percentage frequencies | | | | | |
|---|---|---|---|---|---|---|
| | Total ulcer | | Duodenal ulcer | | Gastric ulcer | |
| Age group (years) | Necropsy* | Population survey† | Necropsy* | Population survey‡ | Necropsy* | Population survey‡ |
| –25 | 0.5 | 1.8 | 0.5 | 0.9 | 0.0 | 0.0 |
| 25– | 3.4 | 3.4 | 2.5 | 1.9 | 0.1 | 0.3 |
| 35– | 4.1 | 7.0 | 2.5 | 2.0 | 0.5 | 0.5 |
| 45– | 6.7 | 9.6 | 3.8 | 3.2 | 1.9 | 1.1 |
| 55– | 7.1 | 9.0 | 3.2 | 3.8 | 2.6 | 1.2 |
| 65– | 6.2 | 7.7 | 3.4 | 2.9 | 1.8 | 0.8 |
| 75+ | 5.1 | | 3.7 | | 0.8 | |

* Data of Watkinson (1960) † Doll *et al* (1951) ‡ Pulvertaft (1959).

## Ulcer frequency and morbidity in closed communities

Studies of sickness records in a closed community have the serious limitation that the population is likely to be highly selected. While ulcer subjects in army surveys have usually been well documented, and the size and age distribution of the population at risk is known, the population is highly selected as physically disabled subjects are continuously being excluded. However, Baron and Vaughan Jones (1958) were able to demonstrate lower attack rates in the British army (1.8 per 1000) than in the American army (2.5 per 1000) (Sullivan and Palmer, 1952).

Studies in doctors, again a highly selected group, have yielded some interesting facts. While the occupational surveys of Doll and his colleagues in 1951 on male British doctors suggested an increased incidence of peptic ulcer, this could not be confirmed by a study of male American doctors in 1969, in whom the ulcer frequency in all age groups was comparable to that found in population surveys undertaken in Britain at the same time (Monson and MacMahon, 1969;

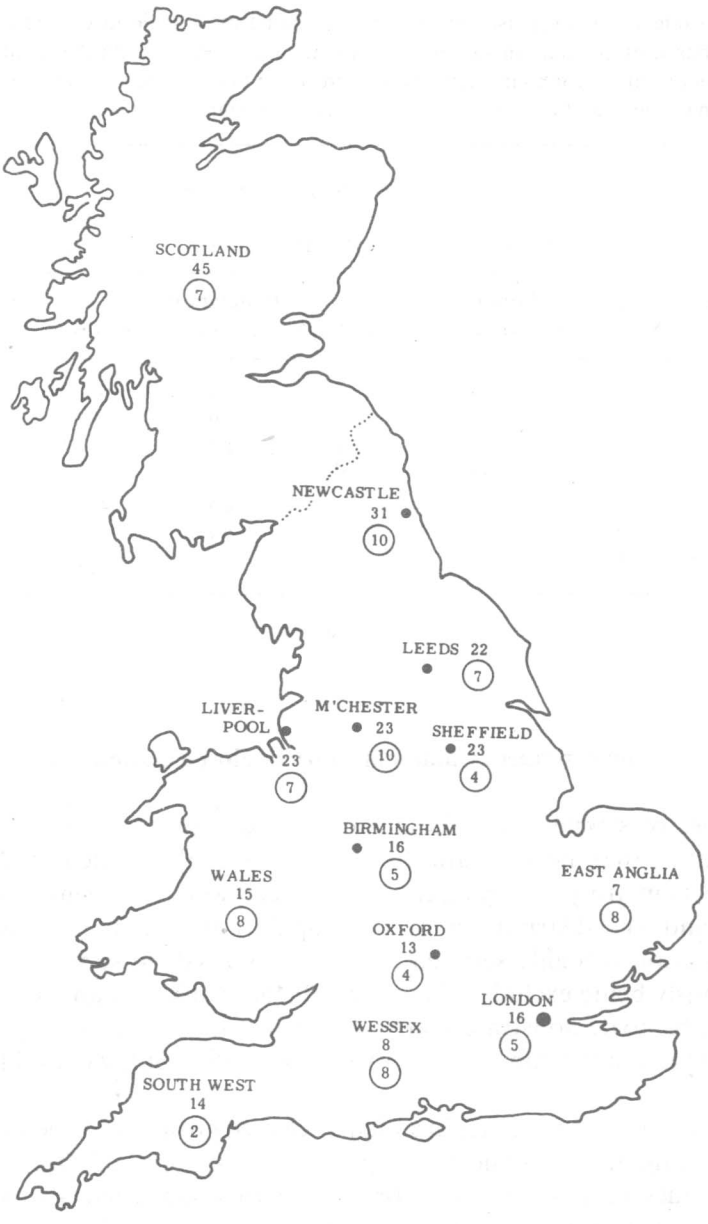


**Fig. 1.1.** Regional variations in admission rates per 100,000 for perforated peptic ulcer in England, Wales and Scotland. Rates for duodenal ulcer are placed above those for gastric ulcer, which are ringed. No regional changes in gastric ulcer are observed but admissions for duodenal ulcer become progressively more common on moving from south to north (Brown *et al*, 1976).

Pulvertaft, 1968). Slight interspeciality variations were apparent, physicians and those in medical specialities having a relatively low rate of 7.4%, surgeons slightly more at 8.3%, while the stresses of anaesthesia increased the rate to 11% and the equanimity of psychiatry reduced it to 4.8%.

Meade and his colleagues (1968) were able to document a declining incidence of ulcer frequency in British doctors in whom the standardized incidence of duodenal ulcer in the age-range 35–64 fell from 0.21% in the period 1947–50 to 0.1% in 1961–5.

**Prospective surveys of ulcer frequency in particular towns or localities**

There is no doubt that the best method of assessing ulcer frequency is by a planned survey of the whole population of a particular town or locality, or of a random sample drawn from this population.

The Norwegian physician, Romcke, was able to assess ulcer frequency in the town of Drammen by taking advantage of wartime conditions under the German occupation when, in order to obtain extra rations, all patients with a peptic ulcer had to be medically certified and registered centrally. By retaining these certificates and confirming the diagnosis in 1947, the overall ulcer frequency was accurately assessed at 2.45% in the population of 25,830 (Knutsen and Selvaag, 1947).

Another notable population survey was that of Pulvertaft in the city and surrounding rural districts of York in 1959 and 1968. In addition to obtaining accurate prevalence rates of overall ulcer occurrence (Table 1.2), and those of ulcer perforation, Pulvertaft was able to demonstrate a greater frequency of both gastric and duodenal ulcer in men living in towns than in those living in the country. Weir (1960) and Weir and Backett (1968) demonstrated similar differences in Aberdeen and north-eastern Scotland. Pulvertaft (1968) demonstrated that these differences in frequency were disappearing as were social class differences between town and country.

The most recent population survey is currently proceeding in Copenhagen where the incidence of gastric and duodenal ulcer is being accurately assessed, the morbidity recorded, and the frequency of associated diseases documented. The study is based on a truly random population of the Copenhagen County, representing both urban and rural populations and impeccable statistical methods are being used.

This study has yielded, and will continue to yield, important data on the frequency and natural history of ulcer (Bonnevie, 1975, 1977).

It should be pointed out that the diagnosis of ulcer in all these surveys was based on clinical, operative and especially on radiological findings, which included many duodenal scars. The radiological diagnosis of a duodenal scar has been described as 'mainly guess-work' and 'a waste of time and unnecessary irradiation of the patient' (Pulvertaft, 1968). In the last decade, modern endoscopy has brought much more precision to the diagnosis of duodenal ulcer and for this reason it should be possible to collect far more accurate data in future surveys.

## Hospital clinical records

Hospital records have serious defects, being affected by variations in the diagnostic criteria and the degree of completeness. Furthermore, the population at risk is seldom precisely known. Only a small proportion of ulcer patients are referred to hospital and these tend to be patients with intractable symptoms or complications. The development of new forms of medical treatment for ulcer, such as carbenoxolone and cimetidine, has further reduced the number referred for hospital treatment. Valuable surveys could be done in general practice and the emergence of health centres serving relatively large populations should make this possible. Watkinson (1961) used patient consulting rates in general practice to relate regional differences in ulcer to similar regional differences in bronchitis and ischaemic heart disease; the results suggested that these diseases might be associated.

Perforation is a serious complication of ulcer which necessitates admission to hospital; perforation rates have been used to study changes in ulcer occurrence over the years (Illingworth *et al*, 1944; Jamieson, 1955; MacKay, 1966; Pulvertaft, 1968) and regional differences (Pulvertaft, 1968; Weir, 1960; Sanders, 1967). The precision which emergency endoscopy has brought to the diagnosis of the causes of upper gastrointestinal bleeding may also allow some conclusions to be drawn about regional differences in the frequency of chronic ulcer and erosive gastritis and will be referred to later.

A more reliable source of data which has been much used to demonstrate chronological changes in ulcer frequency by Langman and his colleagues (1974, 1976) is the Hospital Inpatient Enquiry (HIPE) where the diagnoses of a 10% sample of hospital admissions