Gut, 1992, **33**, 429–431

Gut

Leading article

Helicobacter pylori: the African enigma

Data on *Helicobacter pylori* infection in Africa are at odds in several aspects with those published in the west. Gastric *H pylori* infection is common, almost ubiquitous in Africa, but the pattern of infection, age of acquisition, environmental, dietary, and genetic influences are different from those in the west. These differences alter the pathological role and clinical relevance of the organism in Africa where, apart from gastritis, there is no established correlation between *H pylori* infection and upper gastrointestinal disease.

Epidemiology

The measurement of circulating antibodies to *H pylori* using an enzyme linked immunosorbant assay provides a simple, reliable, and non-invasive means of diagnosing *H pylori* infection, with a sensitivity of 95% and specificity of 85%.[1] This technique is adaptable, can be used in large numbers of subjects, and has been used to map the epidemiology of *H pylori* infection worldwide.[2,3] Random serological studies have shown that most of the population in Africa are infected by *H pylori* for most of their lives – 70–80% have antibodies to *H pylori*.[4,5] Not only is infection common but it is acquired at an early age. Fifty five per cent of the population under age 10 years have immunoglobulin G (IgG) antibodies to *H pylori* in the Ivory Coast,[4] while half of children aged under 5 have IgG antibodies to *H pylori* in northern Nigeria[6] and the Gambia.[7] These figures derived from serological studies have been confirmed by culture and histological examination of gastric mucosal biopsy specimens. Seventy to 97% of patients with dyspepsia are infected by *H pylori*,[8–13] as are 80% of asymptomatic volunteers.[12,14]

With such a high prevalence of infection, a high prevalence of those diseases said to be associated with *H pylori* infection would be expected.

GASTRITIS

Gastritis is very common throughout Africa and shows a strong correlation with *H pylori* infection. Indeed, as in the west, type B antral gastritis is a good indicator of *H pylori* infection. In endoscopic studies, histological gastritis is present in 80–100% of subjects with dyspepsia[8–13] and was found in 88% of a group of 40 asymptomatic controls.[14]

DUODENAL ULCERATION

The prevalence of duodenal ulcer shows considerable variation in different parts of Africa: a subject comprehensively reviewed by Tovey and Tunstall,[15] who defined areas of high incidence (Nile/Congo watershed and coastal region of West Africa) and low incidence (northern savannah of West Africa). These differences in incidence are not paralleled by differences in the prevalence of *H pylori* infection.

In the dry savannah of northern Nigeria, duodenal ulcer is uncommon. This was first noted by Tovey and Tunstall,[15] and recently confirmed.[16] In a random community survey 28% of adults had experienced dyspepsia in the preceding six months,[16] a figure remarkably similar to the 25–38% recorded in the UK.[17–19] Using the same definition of dyspepsia, and in the same population, duodenal ulcer was found in only 18 of 162 patients, who underwent endoscopy for their dyspepsia[20] – a prevalence of 111/1000 patients with dyspepsia, compared with 178–305/1000 in the UK.[17–19] Duodenal ulceration is then less common in northern Nigeria than in the UK despite the higher prevalence of *H pylori* infection.

GASTRIC ULCERATION

Gastric ulcer is a rare disease in Africa, occurring six to 30 times less commonly than duodenal ulcer.[21–25] In northern Nigeria duodenal ulcer is uncommon, yet gastric ulcer is six times less common.[8] In Ethiopia, Tsega found only 5 gastric ulcers in 1084 patients undergoing gastroscopy, compared with 154 duodenal ulcers.[26] Yet gastritis, which is believed to be fundamental to the cause of gastric ulcer,[27] is present in 90% of Africans, and *H pylori*, which is associated with gastric ulcer in the west, is present in over 80% of Africans.[8–13]

GASTRIC CANCER

Because *H pylori* causes gastritis it has been suggested as a precursor of gastric cancer.[28] Forman *et al* have documented an increased incidence of gastric cancer with increased prevalence of *H pylori* infection in China,[29] and in a case control study in Wales an odds ratio of 2·8 has been calculated for the risk of gastric cancer in those infected by *H pylori*[30]: similar figures have also been recorded in the USA.[31]

In Nigeria *H pylori* gastritis is common, yet gastric cancer is uncommon. In the absence of accurate population statistics the most useful indicator of tumour incidence is the proportional frequency of one tumour compared with that of all other tumours.[32] Using this measure gastric cancer accounts for less than 2% of all malignant tumours in northern Nigeria[33,34] and only 2–3% of malignancies in the Sudan, Uganda, and Zimbabwe.[35–37]

Why, when *H pylori* gastritis is common, are these associated diseases uncommon?

Pathological role of *H pylori*

The mechanism by which *H pylori* exerts its pathological effect is unknown. Wyatt and Dixon suggest that it leads to ulceration only in the presence of gastric metaplasia in the duodenum,[38] and this is increased in hyperacidity.[39] Studies from Africa have shown lower basal and maximal acid outputs in asymptomatic controls[40–42] compared with the UK.[43 44] It is reasonable to suggest that there is less acid, less gastric metaplasia, less duodenal *H pylori* infection, and therefore fewer duodenal ulcers. There is certainly a need to document the prevalence of duodenal gastric metaplasia in Africa and to correlate this with the prevalence of duodenal ulcer. If there is a good correlation this will support the suggestion that it is a combination of gastric metaplasia in the duodenum and *H pylori* infection which is fundamental to the pathological role of *H pylori* in duodenal ulcer. But why do Africans infected by *H pylori* produce less gastric acid when western subjects with *H pylori* infection have been shown to have increased concentrations of gastric acid?[45]

A low prevalence of gastric metaplasia does not account for the low prevalence of gastric ulcer,[21–25] which requires neither high acid output nor gastric metaplasia in the duodenum. Graham has suggested that *H pylori* infection acquired at a young age is less pathogenic than that acquired as an adult, a situation analogous to paralytic poliomyelitis which is more likely to occur if infection is acquired after infancy.[46] With most infection in Africa acquired in early childhoood,[6 7] this may be important.

Different strains of *H pylori* may have differenct pathogenicity. It has been suggested that organisms showing a gastric IgA response to the 120 kDa protein are more likely to cause peptic ulcers.[47] It would be of interest to map the strain types in Africa and to correlate this with the incidence of peptic ulcer. This will become practical if a systemic marker of the *H pylori* pathogenicity is identified.

Environmental and social factors may combine to protect patients from the harmful affects of *H pylori*. Of these, diet may play an important protective role. In India, areas of high and low incidence for duodenal ulcer have been identified and clearly correlated with diet.[48] A pulse, lentil, okra, and millet diet is protective, while a refined rice diet is not.[49] The staple diet in northern Nigeria is millet with large amounts of okra (personal observation) which may well, as in India, help to prevent duodenal ulcer. Other environmental and social factors are also different, for instance, few subjects smoke or take non-steroidal anti-inflammatory drugs in northern Nigeria.[16]

Gastric cancer is a tumour of old age. The life expectancy in Nigeria is only 55 and in the west gastric cancer is uncommon below this age. However, if an *H pylori* induced gastritis is an important initial step in some, it is the age at which the gastritis first occurs which may be important. *H pylori* infection and gastritis occurs 20–30 years earlier in Africa than in the west,[6 7] but this has not led to an increase in gastric cancer in early middle age. The peak incidence for gastric cancer in South Africa is in the seventh decade.[50]

The incidence of gastric cancer is thought to be higher in patients with intestinal metaplasia,[51 52] and it has been suggested that intestinal metaplasia is the result of long term gastric inflammation possibly secondary to *H pylori* infection.[53] Of interest then is the low prevalence of intestinal metaplasia in Africa. In *H pylori* positive patients in the west, 17 to 30% show intestinal metaplasia in gastric biopsy specimens.[28 54] In a series of 157 patients with non-ulcer dyspepsia and 40 asymptomatic controls in Nigeria, intestinal metaplasia was present in only 2% (personal observation) an observation noted in reports from other African countries.[11 55] It is likely that the environmental or genetic factors, or both, which cause the change from gastritis to intestinal metaplasia and subsequently dysplasia and cancer are not present.

Conclusion

Geographical variations in the incidence of peptic ulceration and gastric cancer have been apparent for many years, but in Africa these are not accounted for by variations in the prevalence of *H pylori* infection. Indeed, with the exception of gastritis, the case for a pathological role for *H pylori* in Africa is unproved.

Above all else, the data from Africa underline the multifactorial nature of the cause of peptic ulcer and gastric cancer. *H pylori* exerts its influence in concert with other environmental, social, and genetic factors. The relative importance of these and how they interact in a given community or individual remain to be elucidated.

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