

reference

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GASTRO INTESTINAL DISEASE AND DIET

Some investigations that might be undertaken in different parts of Africa and elsewhere in an endeavour to relate patterns of gastro-intestinal disease to bowel behaviour and content, and in turn to diet:

A. CONDITIONS TO INVESTIGATE

1. Oesophageal cancer
Speiseröhre
2. Peptic ulcer
Verdauung - Geschwür
3. Appendicitis
Blinddarm
4. Diverticular disease of the colon
Divertikulose
5. Cancer of colon and rectum
Darm Mastdarm

B. SOME ESTABLISHED FACTS

1. Oesophageal cancer

This tumour shows greater incidence variations in different parts of Africa and steeper gradients from rare to common, than any other neoplasm with the possible exception of Burkitt's lymphoma.

In some areas oesophageal cancer is by far the most commonly recorded tumour, and in others no case has been seen in spite of prolonged searching.

2. Peptic ulcer

With the exception of Southern Rwanda and Burundi and parts of Southern Nigeria, this condition appears to be rare in rural areas of sub-Saharan Africa. Gastric ulcers are rare throughout but duodenal ulcers are becoming increasingly common in Nairobi and in large towns in West Africa. For some time they have been common in Johannesburg.

Duodenal ulceration is now so prevalent in Khartoum that an estimated 10 - 15 perforated ulcers are admitted every month.

In contrast, Williams has seen no case of perforated peptic ulcer or pyloric stenosis in 28 years in North-west Uganda. Wilkinson saw no stenosis and only two cases of ulcer perforation in 23 years in Northern Kenya. At Kakamega hospital in Western Kenya, with 300 beds, Mendes, the Provincial Surgeon, saw only one perforation and no stenosis in two years. Doctors with long experience at Ndanda and Makiungu in Central Tanzania saw no perforated ulcers or pyloric stenosis and a corresponding rarity of these conditions has been reported from South-east Tanzania.

In extreme Western Tanzania the incidence appears to rise a little towards Rwanda and Burundi. In several hospitals in Burundi approximately a third of all major surgery is for pyloric stenosis due to duodenal ulceration, but perforations are very rare. Peptic ulcer is apparently much more common in Southern than in Northern Nigeria and again gastric ulcers are rare and stenosis is much commoner than perforation.

3. Appendicitis

In 1920 Rendle-Short argued convincingly that the rapid rise in appendicitis in Europe and America in the early part of this century was related to the adoption of a low roughage diet and in particular to the increased consumption of white flour. Changes which occurred in the West half a century ago are being paralleled in parts of Africa today where acute appendicitis is still almost unknown in rural areas.

Of 24 mission hospitals in East Africa who replied to a questionnaire, none saw more than an estimated three cases a year. Ten hospitals saw one or less, and four doctors who were all doing a great deal of surgery had never seen a case. Two of them were speaking from 28 and 17 years service respectively. A doctor with very extensive surgical experience in Burundi had seen one case in 18 years and another saw one case in 30 years in Southern Tanzania.

In contrast it was estimated that 120 cases of acute appendicitis a year were admitted to Korle Bu Hospital in Accra, over 200 to Khartoum General Hospital and 150 to Barangwath hospital in Johannesburg. One hundred and thirty counted cases were admitted to the Kenyatta Hospital in Nairobi in 1967.

Thirty years ago appendicitis was rare among poorer American negroes. It was becoming more common in the educated negro and was significantly more common in the white population. Today the incidence is approximately the same in the white and coloured communities in America (Fig. 1) Appendicitis is rare in Japan.

It has been reported to be uncommon in vegetarians.

4. Diverticular disease of the colon.

This condition, so common in the Western world, is still almost unknown in tropical Africa, yet the incidence in American negroes now approximates to that of their white compatriots (Fig. 1). Only one of 28 rural hospitals in Africa had ever seen a single case, and it was not specifically stated whether this was in an African.

This condition is however beginning to be recognised in the urban communities in the larger cities in Africa (Fig. 1). It is commoner in the Japanese immigrants to Hawaii than it is in Japan.

5. Cancer of the colon and rectum.

With the exception of bronchial carcinoma, cancer of the colon is more closely related to Western civilisation than any other tumour. Rectal cancer is also related but to a lesser degree.

Of particular interest is the observation that the incidence of bowel cancer in American negroes has risen from a presumably low initial level to near parity with whites and that a similar incidence rise can be detected in second generation Japanese immigrants (Fig. 1).

From both East and West Africa, it has been reported that, in contrast to Western countries, the caecum is involved considerably more frequently than the pelvic colon.

In South Africa, where the incidence of bowel cancer in the Bantu is only a tenth of that of the white population, it has already been recognised to be more common in urban than in rural Bantu, and many more cases are seen in Khartoum than in the more recently Westernised cities in East or West Africa.

Entzündung des Lymphknoten

 6. Regional Ileitis (Crohn's disease)

Although it is not proposed to specifically investigate this condition it is interesting to note its great rarity if not total absence in tropical Africa. Elliot-Smith saw one case in an urban Libyan during two years at Tripoli.

(diverticuli)
Polyposis - Oxy *Zolle* *jetonix Geschw.* *Sturely d. Orschelms*

 7. Polyposis, villous adenoma and ulcerative colitis.

All these are also rare or unknown throughout tropical Africa and appear to be geographically related to the other bowel diseases enumerated above. It is not proposed to investigate these conditions at this stage.

8. Some observations relating to bowel behaviour and content.

a) Available knowledge suggests that total bowel transit time in primitive communities is less than 12 hours, whereas in Western countries it is in the region of 3 - 5 days.

b) Studies in Indonesia showed the daily weight of natives' stools to be 600 - 800 gms. whereas it was less than 200 gms. in Europeans. The weight of dry faeces in the South African Bantu has been shown to be double that in the white population.

c) A recent study from St. Mary's hospital, London, showed that there is a 30-fold increase in some of the bacterial elements in stools from Londoners compared with Uganda women.

d) A Sudanese surgeon recently informed me that he found considerable difficulty flushing down the W.C. the floating stool of a newly arrived servant from the South. With change of diet the problem disappeared. To what extent stools float or sink might be a simple method of estimating consistency. Please state the situation in your community on the back of the proforma recording bowel behaviour.

the specific gravity

C. SOME REASONABLE ASSUMPTIONS.

1. There appears to be overwhelming evidence that the gastro-intestinal conditions referred to above are environmentally rather than genetically determined. It would seem reasonable to assume that food and drink either in content, quantity or mode of preparation, are the factors contributing most to bowel environment and consequently responsible for anomalies in intestinal behaviour and faecal content.

2. When several conditions are related geographically and chronologically to one another, as are appendicitis, diverticular disease and bowel cancer in American negroes, it is at least likely that they are related to a common cause.

3. Although the diagnosis of peptic ulcer from other causes of upper abdominal pain may be difficult, the incidence of complications demanding urgent surgery (perforation, haemorrhage, stenosis) will give some indication of prevalence. If none of these complications are seen peptic ulcer may be considered rare.

4. If virtually all ulcers in an area conform to one type there must be some peculiar localised aetiological factor. In Burundi for example the exceptional incidence of chronic stenosing duodenal ulcers contrasts with the rarity of perforation and of gastric ulceration.

on glucose

D. A PREFERRED HYPOTHESIS.

If epidemiological studies are to bear fruit a hypothesis of aetiology consistent with known facts must be postulated. An effort must then be made to prove or disprove it with resultant confirmation, modification or rejection.

After very extensive epidemiological studies ^{Cleave} Campbell (1969) has produced convincing evidence that a wide spectrum of diseases may be largely due to one major contributory factor, namely the excessive consumption of refined carbohydrates, particularly sugar and white flour. It is beyond my province or competence to discuss relationships between coronary disease, diabetes and sugar intake. Although I have confirmed the rarity of venous ailments such as varicose veins, haemorrhoids, femoral thrombosis and pulmonary embolism in rural communities in Africa, I consider it best at the moment to restrict myself to a study of some of the major diseases of the gastro-intestinal tract, in order to substantiate or disprove the hypothesis that these are largely due to low residue diets.

^{Spiller} Cleave is convinced that peptic ulceration is related to mechanical processing of grain or rice with resultant stripping of protein which has an important buffering action against gastric hydrochloric acid. ^{which is} A diet rich in manioc they likewise consider protein deficient and similarly likely to result in unbuffered gastric acid.

With regard to diverticular disease and bowel cancer, it seems probable that these are related to a deficiency in the cellulose content of the faeces, and appendicitis could be related to both cellulose deficiency as considered by Rendle-Short, and to excessive sugar with resultant bacterial proliferation as suggested by Cleave.

Having regard to the changes in bowel motility and content noted under B.8 above, it would be strange if these changes were not associated with pathological changes.

The late Dr. George Oettle, addressing a conference on gastro-intestinal cancer in Africa, emphasised that "the rarity of carcinoma of the small bowel, by comparison with the high incidence in the colon and rectum, is consistent with the hypothesis of a carcinogenic agent in the lumen whose action is potentiated by increased concentration and duration of exposure. It is noteworthy that conditions among the South African Bantu and similar groups would tend to reduce the intensity of exposure to such hypothetical agents".

It is postulated (and I owe a good deal of my thinking to Cleave, Rendle-Short and others) that these bowel diseases, exceedingly common in the Western world and rare in rural Africa, are to a large extent due to altered bowel behaviour and content which reflects dietary customs.

E. INVESTIGATIONS PROPOSED.

1. Oesophageal cancer.

This is one of the tumours on which we have been concentrating for some years but I do not propose to suggest a sequence of investigations for this problem as detailed studies are being undertaken by the International Agency for Research in Cancer. One of these studies will be the relationship between tumour incidence and imbibed spirits with particular reference to nitrosamine content.

2. Peptic ulcer.

To determine and define areas or communities in which peptic ulceration is other than rare and to relate incidence increase to dietary habits.

Chronologically the rise in incidence could be estimated by searching in operating theatre records for mention of complications such as perforation, haemorrhage or stenosis and for evidence of non-emergency ulcer surgery.

In any prospective study the dietary habits of the individual patient should be recorded.

An effort should be made to look for common factors present or lacking in groups with an unusually high or low incidence of peptic ulceration with particular reference to the diet of the individual patient. It is unlikely that tests in gastric acidity associated with a particular diet would be meaningful for, as Cleave emphasises, the very presence of a gastric tube abolishes all pretence of normality in gastric behaviour. Any increase or decrease in ulcer incidence or change of diet would be particularly significant.

3. Appendicitis

a) A survey has already demonstrated the virtual absence of this condition in rural hospitals in East and West Africa.

b) A retrospective survey of operating registries in central hospitals would date the period of increased incidence in different centres and possibly enable the rise to be related to a change in dietary or other habits.

c) In a community in which occasionally individuals develop acute suppurative appendicitis a much larger number probably develop minor degrees of appendicular infection. Painter has suggested that a number of appendices removed at autopsy from some African hospitals might be compared histologically with age-matched appendices similarly obtained in the U.K. It might be that fibrotic changes are evident in a significantly larger number of the English appendices. Preferably the same pathologist should review both lots of sections.

4. Diverticular disease

a) A number of barium enemas could be reviewed retrospectively for any evidence of diverticulae. Any chronological rise in incidence in large urban centres would be particularly significant, particularly if this were related, though after a latent period, to a rise in incidence of appendicitis.

b) A series of cases over 40 years of age could be specifically examined for evidence of diverticular disease in some African centres and a matched series studied for comparison in England.

c) At a subsequent stage of investigation intraluminal pressures might be estimated and compared with U.K. figures.

5. Cancer of the colon and rectum.

a) Cancer registries and operation records could be reviewed to determine any chronological rise in frequency of bowel cancer. Where possible the educational and economic status of the patient should be assessed.

b) Prospectively particular attention should be paid to the dietary habits of patients who develop large bowel cancer.

F. MAJOR INVESTIGATION RELEVANT TO ALL CONDITIONS ENUMERATED ABOVE.

Estimation of:

Total bowel transit time

Stool weight

" consistency

" bulk

Full details of this project are given in Appendix I. The method evolved by Hinton, Lennard-Jones and Yard has been adopted in view of its simplicity and economy.

After a wide survey of bowel behaviour the findings will be correlated with dietary habits of different groups and communities. Groups with contrasting bowel behaviour will be selected for additional investigations:

a) Fractional as against total transit time to determine site of maximum hold up. This will involve X-raying the patient following ingestion of shapes, at times suggested by the total transit survey which will by then have been determined.

In view of the preponderance of caecal over pelvic colon tumours in Africans, it will be particularly important to estimate relative hold up in the proximal and distal colon.

b) ~~Estimations of bacterial content of stools~~ both qualitatively and quantitatively. Professor Williams of St. Mary's Hospital, London, has offered to help in this aspect of the investigation.

G. SUMMARY OF INVESTIGATIONS PROPOSED IN DIFFERENT CENTRES

1. Retrospective survey of operation registers for:
 - a) Acute appendicitis
 - b) Perforated peptic ulcers
 - c) Pyloric stenosis
 - d) Bowel cancer
 - e) Controls, eg. prostatectomy, strangulated hernia or volvulus.
2. Barium enema films.
3. Retrospective search for cases of bowel cancer in hospital or cancer registry records.
4. Prospective search for evidence of inflammation in autopsy specimens of appendices or pelvic colons, with search for evidence of colon diverticulac.
5. Estimation of bowel transit times and weight, bulk, consistency and bacterial content of the stools, with a detailed record of current diet of patients investigated.

It could be of particular interest to observe the changes occurring in countries undergoing rapid changes following the discovery of oil wealth.

It is also important to establish incidence base lines now against which future observations can be measured. Total negatives will be as valuable as other observations in this study.

H. AIMS AND EXPECTATIONS.

Dr. Brandon Lush of the Medical Research Council has suggested that all research proposals should end with a decisive answer to the pertinent question: "So what?" implying that the information sought should be related to pressing needs and practical objective.

This question is easily answered with regard to the proposals outlined above.

If dietary habits can be shown to be one of the major factors contributing to the cause of several of the most important ailments to which Western man is subject, these can be assumed to be to a large extent potentially preventable. It should then be possible to suggest measures whereby much suffering could be prevented, many hospital beds made available for other diseases, and the loss of millions of working days annually saved. Moreover the annual saving to the Exchequer could be enormous.

Even though the response might be no more than that which followed the demonstrated causal relationship between lung cancer and cigarette smoking, it seems worthwhile endeavouring to investigate relationships between diet and disease.

POSTULATED RELATIONSHIP BETWEEN DIET AND COLON DISEASE

DIET	EFFECT ON BOWEL				DISEASE SUSCEPTIBILITY
	Transit	Stool bulk	Stool consistency	Intra-lumen pressures	
Bulky High residue Unrefined	Rapid	Large	Soft	Low	Low
Concentrated Low residue Refined	Slow	Small	Hard	High	High Appendicitis Diverticulitis Carcinoma Polyps Ulcerative colitis

