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**Some Aspects of the Cancer Situation in Uganda**

The figures which Professor Knowelden has demonstrated are derived from those patients registered in the Kampala Cancer Survey 1954–60 who were proven residents in the county of Kyadondo. They represent only a small part of the total material available for site and type analysis. In the survey every source of medical care available to those ill with cancer was covered (Davies *et al.* 1958).

The techniques of coverage had been worked out over a number of years (Davies 1957) and there is reason to believe from various cross-checks that virtually every case seeking medical attention was recorded, though a few will always escape any net.

On hearing the results of Professor Knowelden's preliminary analysis of African patients and the absence of evidence of the expected steep rise with increasing age, the survey mechanisms were overhauled. We had not expected this relative lack of cancer in the elderly African. In the very much smaller European and Asian communities the rise in incidence rates with age was demonstrable even with the very much smaller number of cancer cases. The defect lay solely in the African population. There was nothing in the mechanics of the survey to lead to failure to register older patients; in fact over-estimation of age by patients was more of a problem. It was clear that the ages of elderly patients could be estimated with reasonable precision, certainly to within a decade. Kyadondo is a well doctored area, with good communications, treatment is free and the well equipped and staffed hospitals are besieged by hordes of patients with complaints which vary from the trivial to the rapidly lethal. Medical attention is readily sought and appreciated. Elderly people command respect and attention and the clan system sees that their needs are met. They form a higher proportion of the hospital admissions and of the autopsied than of the total population. In elderly patients autopsied, whether hospital patients or medico-legal cases, very few occult or clinically unsuspected cancers were found and none of the cancers that are so predominantly absent from our records. Having come to hospital elderly patients were no more reluctant to be biopsied or otherwise operated on than the younger. There is thus no evidence to suggest that failure to seek medical attention in the Kyadondo area could have been on such a scale as materially to affect the incidence rates.

Moreover, if bias and selection were distorting the Kyadondo incidence rates, with a great amount of undiagnosed cancer in the Kyadondo population, then these factors were behaving in an unusual manner, because there is a most peculiar pattern of site distribution of cancer. We can go further and say that this pattern of site distribution has been remarkably stable over the last six decades since Albert Cook founded his famous missionary hospital at Mengo in 1897. He entered Uganda when everything imported had to be carried by headload, at monstrous expense, 800 miles from the East African coast, and Western influences cannot at that time have affected the indigenous way of life to any extent. In 1901 (Cook 1901) it was recorded that cancer was common in Uganda and that jaw tumours were particularly common. The ratio of cancer to total admissions in Mengo Hospital has been remarkably constant, 0·7%, 0·7%, 0·95%, 0·61%, 0·57%, 0·91% over the last 6 decades despite considerable alterations in the type of patient admitted due to the decline in parasitic diseases over this period (Hutt 1962, personal communication). Cook's major cancer problems in 1897–1906 are essentially those of the Uganda of today (Tables 1 & 2).

*Table 1*
**Mengo hospital admissions**

| | *1900* | *1910* | *1920* |
|---|---|---|---|
| 'Fever' | 28% | 16% | 7% |
| Non-specific infections | 19% | 18% | 22% |
| Venereal disease | 8% | 13% | 28% |

*Table 2*
**Cancer site percentages**

| *Site* | *Mengo Hospital 1897–1906* | *Mengo District 1952–1960* |
|---|---|---|
| 'Hepatomas' | 5% | 7·8% |
| Penis | 8% | 7·6% |
| Uterus | 11% | 12·0% |
| Lymph nodes | 11% | 9·7% |
| Mouth/tongue | 3% | 1·1% |
| Salivary | 8% | 2·6% |
| Bone | 5% | 1·7% |
| Skin | 3% | 10·6% |
| Breast | 8% | 4·7% |

The pattern of type distribution, as far as our analyses have gone, is equally peculiar and this raises acutely, but in a different way, the question of bias and selection. Thus Dodge (1962) has shown how the type of urinary bladder tumours differs from that of Europe. In 71 cases there was only one transitional cell papilloma, 30 transitional papillary carcinomas of which 15 showed squamous metaplasia and 26 squamous carcinomas. Great Britain's 2% of the latter contrasts

with 28% in Kampala, a non-schistosomal area. Dodge noted that in the Kampala figures bladder cancer was more common than gastric carcinoma and less common than Kaposi sarcoma. The difficulty then is that a surgeon working in Africa, under great pressure of work, might well prefer to deal with and so preferentially select, say, bladder cancer rather than breast cancer to operate upon, or *vice versa.*

But once this decision is made it is difficult, since most cases are biopsied, to see how bias could produce such distorted patterns of types of cancer within a selected site.

It had been shown (Davies *et al.* 1958) that there were no essential differences between Kyadondo and non-Kyadondo patients in site frequencies, allowing for a rather higher proportion of cancer of inaccessible sites in the Kyadondo cases. It seems legitimate therefore to amalgamate these series to study the patterns at the various sites. Other discrepancies immediately become evident. Thus, colonic cancer presents oddities of distribution (Table 3). There is an excess of cancer in the cæcum and ascending colon and a marked deficiency of cancer of the sigmoid and rectosigmoid regions. In seven cases the site was not precisely specified and if all these were in fact sigmoid or rectosigmoid the proportion of colonic cancer at this site rises only to 28%, considerably less than in other series (Boehme & Hanson 1946).

*Table 3*
**Colonic cancer**

| *Site* | *USA (Boehme & Hanson 1946) No. of cases* | *Kampala 1948–1960 No. of cases* |
|---|---|---|
| Not precisely located | 0 | 7 |
| Cæcum | 95 (14·3%) | 23 (33·3%) |
| Ascending colon | 48 (7·2%) | 9 (13·0%) |
| Hepatic flexure | 43 (6·5%) | 1 (1·4%) |
| Transverse colon | 66 (10·0%) | 8 (11·6%) |
| Splenic flexure | 34 (5·1%) | 2 (2·9%) |
| Descending colon | 58 (8·7%) | 6 (8·7%) |
| Sigmoid and pelvic | 319 (48·1%) | 13 (18·8%) |
| Total | 663 | 69 |

There is in Uganda such a different pattern of site and type of cancer that it is not surprising that there are such differences in the rates at the older ages. The position is exactly that found by the Johannesburg workers (Higginson & Oettlé 1960). Their rates did not rise in the expected way with age and they could find no evidence that this was due to unwillingness to attend hospital or to seek medical attention at some stage of illness. They found, as in Uganda, marked deficiency in breast and gastro-intestinal cancer and in other cancers which, particularly in other countries, are responsible for the rapid rise with age. Breast cancer is a particularly interesting example. In southern Uganda the high incidence of female infertility is notorious. Perhaps one-third of the population is infertile so that, although the rest lactate for long periods, a high frequency of breast cancer might be expected. This is not the case. Yet this is a superficial, accessible, easily diagnosed tumour which is notorious for the unpleasant local effects of the untreated mass and for the pain of the distal metastases. It is true that there is no radiotherapy to offer in Uganda but the frequency of breast cancer may be compared with that of the cervix uteri, equally unpleasant in its local late effects. Women suffering from these effects are grateful for the temporary easement that can be afforded by a course of antibiotics, for which the sufferers readily apply. The lack of breast cancer contrasts with the plenitude of ovarian cancers in Uganda, an internal obscure cancer. Moreover, there is no reserve of unspecified cancer, where the primary was not located, to make up deficiencies. The histological verification rate was well over 70%.

Interest will rightly and naturally focus on the deficiencies in the elderly people. It is even more amazing that in children up to 15 years the rates in Uganda are very similar to those of Norway, but there are remarkable differences in the cancers in children under 15 making up these rates. Before the rates were known, O'Conor & Davies (1960) had shown that malignant lymphomas made up one-half of all childhood malignancies in Uganda and that the ratio of leukæmia to lymphoma was the reverse of that in America. If it is suggested that this is due to consistent under-diagnosis of leukæmia and the ratios are adjusted to the American level, the Uganda childhood rates would then be far above those of the USA. This is not impossible but, with all the other causes of death in African children, is most unlikely.

We are driven to accept a pattern of cancer in Uganda different from that of Norway or the USA and there are the clearest possible indications that this must in large part be due to environmental causes which affect the rural peasant farmers of southern Uganda. This is evident from the high frequency of squamous carcinomas of the leg arising in tropical ulcers, of carcinoma of the ocular conjunctivæ, of melanomas of the same site and of the soles of the feet and of primary liver cancer and penile cancer, to mention only a few examples. To discuss possible reasons for

these excesses of cancer in the environment of Kampala would take us into another stage of the epidemiological study of cancer in Africa. A case could be made for considering the effects of childhood malnutrition (Davies 1952), in particular for its effects upon the liver (Davies 1949), and the possibility of this being responsible for the high output of œstradiol in the urine (Bersohn & Oelofse 1957). The effects of diet must be considered in the light of Crawford's (1962) observations from Uganda on the daily drenching of the bodies of plantain eaters with serotonin and similar substances. The influence of parasites, e.g. schistosomiasis, is worth investigation especially in the light of changes in the urinary enzyme content shown by Fripp (1961) in Kampala. There is the influence of climate which, as Burkitt (1962) has shown, decides the distribution of lymphoma in children. There is the influence of tribal customs and habits such as circumcision.

All these cry out for investigation in Africa for the cancer pattern in other parts of that continent clearly differs markedly from the pattern established in Uganda. South Africa does not have the childhood lymphoma nor the abundance of other jaw tumours prevalent in Uganda. There is not in Uganda the fantastic incidence of œsophageal cancer or lung cancer reported from further south. In Uganda gastric tumours are infrequent; but in the Katana area of the Congo, across the Congo Basin Watershed, where the waters are alkaline, gastric cancer is common, 25–29% in recent survey reports (Gigase 1962, unpublished). In Kenya (Clifford 1961) there is a different picture again, due to the high frequency of tumours of the post-nasal space and of the nose and nasal sinuses.

Uganda is only a small part of Africa and in other areas where soils, climates, diets, tribal customs and other circumstances are different, the cancer patterns are also different. It is these differences which make Africa such a valuable field for studies in the ætiology of cancer.

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**Mr Alan White** (*Bulawayo, Southern Rhodesia*) said that the pattern of site and type of cancer in Southern Rhodesia differed both from that of Uganda and from that of Europe. A detailed survey had only just been started, but since 1961 they had known of the failure of the Uganda workers to demonstrate a steep rise in cancer rates in Africans of the older age groups. This was an obvious focus of criticism, suggesting that there might be an uncovered reservoir of cancer in the older Africans who died without seeking medical attention. In Bulawayo, with a population of over 150,000 Africans, death without medical certification had been virtually eliminated so that 97·3% of all dying in hospital were subject to autopsy. The minority escaped either because they were Moslems or through administrative oversight. This virtually complete autopsy study had failed to show any such reservoir of undiagnosed cancers, especially of the breast and gastro-intestinal system. Concealed cancer in this population was a negligible factor except as regards primary hepatic carcinoma, which was found in a considerable number of cases in which the diagnosis had not been suspected clinically.

A sociological survey was now being made into the use by older Africans of the hospital services and to determine how many returned to the rural community when sick. The older age groups were well represented in the hospital population but the age structure of the urban population was not the same as that of the rural population, since the younger men in particular emigrated to industry in the towns.

The Kyadondo rates were those of a rural peasant population. The Johannesburg rates came from an African proletariat in the most highly industrialized part of Africa. In both there was a deficiency of breast and gastro-intestinal cancer. Œsophageal cancer was common in South Africa and in Rhodesia and was the commonest single cancer of the gastro-intestinal tract. It occurred commonly in the third or fourth decade of life, 75% in the middle third and 25% in the lower third of the œsophagus. Carcinoma in the upper third of the œsophagus and in the hypopharynx was remarkably rare. The tumour appeared often to develop in multicentric foci. North of the Zambezi œsophageal cancer seemed to be far less common.

Mr White could confirm for Rhodesia the anomalous distribution of large intestine cancer found in Uganda. Only one case in five years had occurred other than in the rectum or the cæcum and ascending colon. This was of diagnostic importance in that a colonic stricture in an