

Controls were younger than patients, but there was no significant correlation between concentrations of BNP and age or sex. LVEF, diastolic diameter, and BNP concentrations are shown in the table. BNP concentrations were significantly higher in group 2 than in group 1 or controls (table), and correlated with LVEF ( $r_s=-0.46$ ,  $p<0.0001$ ) and left ventricular diastolic diameter ( $r_s=0.42$ ,  $p<0.0001$ ). A BNP concentration of 60.7 pmol/L or more, has a sensitivity of 80%, specificity of 93%, positive predictive value of 52%, and negative predictive value of 98%. None of the patients with Chagas' disease with a normal electrocardiogram and chest radiograph had LVEF of 0.40 or less. In those with an abnormal electrocardiogram or chest radiograph, or both, raised BNP has sensitivity and positive predictive value of 80%, and specificity and negative predictive value of 97%.

Patients with Chagas' disease have high plasma concentrations of BNP in association with impaired left ventricular function. Since rapid BNP assays are now commercially available,<sup>5</sup> this finding has major clinical implications in regions where Chagas' disease is a cause of heart failure. In view of the high negative predictive value, a normal BNP concentration suggests a very low probability of global left ventricular dysfunction. By contrast, high BNP concentrations can accurately identify patients who should have an echocardiographic investigation. Since patients with Chagas' disease with a normal electrocardiogram and chest radiograph are unlikely to have reduced LVEF, BNP measurement could be especially useful in those with an abnormal electrocardiogram or chest radiograph. The early recognition of patients with low LVEF could allow the use of drugs such as  $\beta$ -blockers and angiotensin-converting-enzyme inhibitors, which can delay the progression of left ventricular dysfunction and reduce mortality.

#### Contributors

A L P Ribeiro designed the study, did statistical analysis, and wrote the text. A M dos Reis and J Braga Pereira planned and did the measurements of BNP concentration in blood samples. M V L Barros and F S Machado did the echocardiograms and subsequent analysis. M R de Sousa, A L L Rocha, and A A Perez selected patients, and gathered and analysed the data. M O C Rocha is the coordinator of this group and was involved in the recruitment, selection, and follow-up of patients.

#### Conflict of interest statement

None declared.

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## Oesophageal cancer: a common malignancy in young people of Bomet District, Kenya

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**Oesophageal cancer is a common cancer with uneven geographical distribution. We reviewed all malignancies diagnosed at Tenwek Hospital (Bomet District, Kenya) between 1989 and 1998. Oesophageal cancer was the most common malignancy; 274 cases accounted for 19% of 1459 malignancies diagnosed, and for a steady rise in total cancer cases during this period. A striking feature of our study was the presence of a subset of very young patients. 26 (11%) patients were aged 30 years or less at diagnosis, and the youngest patient was 14 years old. This area of West Kenya seems to be a high-risk region for oesophageal cancer.**

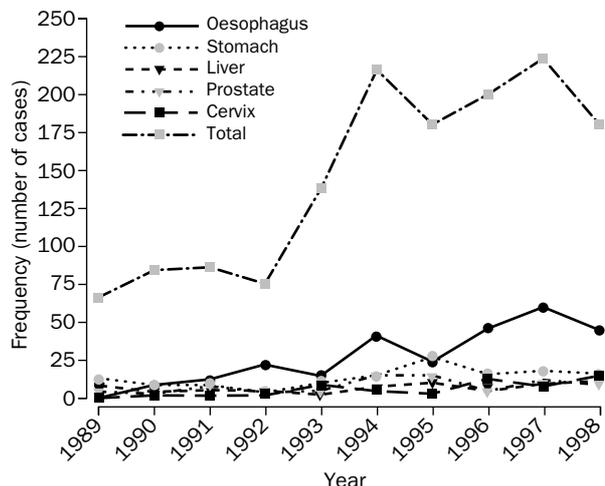
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Oesophageal cancer is the 9th most common cancer in the world, and the 5th most common cancer in developing countries. About 300 000 patients are newly diagnosed every year.<sup>1</sup> A unique epidemiological feature of oesophageal cancer is its very uneven geographic distribution, with high incidence found within sharply demarcated geographic confines. These hot-spots include areas in northern Iran, Kazakhstan, South Africa, and northern China, where annual incidence can exceed 100 per 100 000 per year, and over 20% of all deaths are attributed to oesophageal cancer. By contrast, incidence in most of North America and Europe is much lower, generally between 5 and 10 per 100 000 per year.

	Women	Men	Total
<b>Site</b>			
Oesophagus	114	160	274
Stomach	61	76	137
Prostate	..	79	79
Liver	31	40	71
Colon and rectum	22	39	61
Cervix	59	..	59
Thyroid	38	17	55
Breast	42	9	51
Other skin	29	20	49
Connective tissue	20	18	38
Ovary	37	..	37
Non-Hodgkin lymphoma	15	20	35
Bone	11	21	32
Uterus	28	..	28
Larynx	5	13	18
Leukaemia	7	11	18
Other pharynx	4	13	17
Lip and oral cavity	8	8	16
Melanoma	6	10	16
Kaposi's sarcoma	6	7	13
Burkitt's lymphoma	2	10	12
Bladder	4	7	11
Kidney	6	5	11
Hodgkin's disease	5	6	11
Salivary gland	8	1	9
Nasopharynx	2	6	8
Eye	1	6	7
Bronchus and lung	3	2	5
Pancreas	3	1	4
Brain and nervous system	3	0	3
Other female genitalia	2	..	2
Testis	..	1	1
Penis	..	0	0
Other/unspecified*	108	163	271
All sites	690	769	1459

\*Many of the cases recorded as other/unspecified were advanced cancers that presented as substantial tumours in lymph nodes, in the neck, and on the extremities.

**Cancer cases seen at Tenwek Hospital between 1989 and 1998 by sex**



Frequency of the five most common cancers and total cancer cases seen at Tenwek Hospital between 1989 and 1998 by year

In Africa, several reports have documented a very high incidence of oesophageal cancer in South Africa, particularly in the Transkei. Few reports have information about the occurrence of oesophageal cancer in central and eastern Africa. In Kenya, Ahmed and Cook published several case-series from 1966 to 1971.<sup>2</sup> These reports indicated that in certain regions of central and west Kenya, oesophageal cancer ranked as the first or second most common cancer. In 1978, Gatei and colleagues reported that incidence among the Kipsigis and related peoples of the Rift Valley was 0.2 per 100 000 per year, and the overall incidence for the country was 0.67 per 100 000 per year. This study ranked oesophageal cancer as the 5th most common cancer nationwide, accounting for 5.4% of solid malignancies.<sup>3</sup> Unfortunately, these rates were based solely on cases that were histologically confirmed at the central pathology laboratory in Nairobi and reported to the Kenya Cancer Registry. Most of the outlying, rural hospitals did not have resources to do histological studies. Therefore these numbers were clearly an under-representation of actual incidence. We aimed to do a retrospective, hospital-based study of the prevalence of cancers, especially oesophageal cancer, in individuals living in the Rift Valley.

Tenwek Hospital is a 300-bed mission hospital situated in Bomet District in the Rift Valley, about 200 miles west of Nairobi. Tenwek serves as a primary health-care facility for about 400 000 people. Our case series comprised all patients who presented at Tenwek Hospital between Jan 1, 1989, and Dec 31, 1998, with a cancer at any site. This study was approved by the institutional review boards of Tenwek Hospital and the National Cancer Institute, MD, USA. For each patient, we recorded the site of the malignancy, sex, age, and tribal background without other identifying information, to ensure confidentiality. We are unable to report incidences in our population because no reliable cancer or death registry exists. Furthermore, our counts are certain to be under-estimates of the true prevalence, because some of the population chooses to use traditional medical therapies, and these individuals would not have incident or fatal cancers recorded.

1459 cancers were diagnosed at Tenwek Hospital during the study period. The frequency and site distribution of these tumours are shown in the table. For both males and females the most frequent site was the oesophagus. During this period the annual number of cancers from all sites increased from 67 cases in 1989 to 181 cases in 1998. Of the five most commonly diagnosed cancers in both sexes, only oesophageal cancer increased during this decade (figure). The yearly variation between 1994 and 1998 in total cancer cases

corresponds with yearly changes in oesophageal cancer incidence. The 274 cases of oesophageal cancer seen during the study period accounted for 19% of the total neoplasms seen at Tenwek Hospital. Of these 274 confirmed cases, 114 (42%) occurred in females and 160 (58%) occurred in males, a male:female ratio of 1.4:1. Squamous-cell carcinoma accounted for 246 cases of oesophageal cancer (90%), and 28 cases (10%) were adenocarcinomas. Tribal origin was known in 265 (97%) patients, with the breakdown: Kipsigis 243 (92%), Kisii 16 (6%), Luo 5 (2%), and Maasai 1 (<1%). This distribution was similar to that of the overall Tenwek patient population—Kipsigis (95%), Kisii (2%), Luo (1.5%), and Maasai (1.3%)—which suggests that there was no referral bias due to availability of treatment for oesophageal cancer at Tenwek Hospital.

Our case series featured a subset of very young patients. Age was known in 227 cases (83%). Median age was 56 years for women and 54 years for men, with a range from 14 to 91 years. 26 (11%) of all cases of oesophageal cancer occurred in patients aged 30 years or less, and four (2%) occurred in patients younger than 20 years. We noted no bias towards younger patients for cancers at sites other than the oesophagus.

These proportions of very young patients are much greater than those noted in previous reports of oesophageal cancer. In some high-risk regions, such as Linxian, China, oesophageal cancer cases in people aged 30 years or less are extremely rare, with a proportion of less than 1%.<sup>4</sup> Similar low proportions are seen in low-risk populations; the Surveillance, Epidemiology, and End Results Program<sup>5</sup> estimated that, between 1989 and 1998, the proportion of cases in individuals aged 30 years or less in the USA was 0.18%.

The area that surrounds Tenwek Hospital in the Rift Valley Province of west Kenya seems to be a high-risk region for oesophageal cancer. In this area, oesophageal cancer is the most common cancer in both sexes, and the incidence seems to be rising. A substantial number of young patients have this disease. Patients usually present with advanced obstructing lesions that require either surgical resection or palliative interventions, depending on the clinical condition of the patient. Our findings call for studies to ascertain the actual incidence of oesophageal cancer, to examine the importance of known and new risk factors, and to assess screening programmes to identify disease at earlier stages, when appropriate treatment offers a chance for cure.

#### Contributors

R E White and C K Mungatana abstracted and compiled the data. R E White, C C Abnet, and S M Dawsey jointly interpreted the data and prepared the report. All authors reviewed the final report.

#### Conflict of interest statement

None declared.

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