ORIGINAL ARTICLE

Penang Cancer Cases Reported to the National Cancer Registry Of Malaysia, 1987-1990: An Epidemiological Analysis

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Summary

2,124 cases of cancer diagnosed and/or treated in Penang between 1987-1990 were reported to the National Cancer Registry of Malaysia by hospitals in Penang. 1,762 met the criteria for Penang incident cases first diagnosed between 1987-1990, and were the subjects on which all subsequent analyses were based. 85 per cent of case notifications were from Mount Miriam Hospital. Among males, all-site cancer incidence rates (age-standardised) were highest among Chinese, and lowest among Malays. Among females, the Indian female incidence rate was highest, higher than that of any other ethnic-gender sub-group. Site-specific cancer rates varied according to ethnicity and gender, but overall the four most frequent cancers reported from Penang were breast, lung, cervix and nasopharynx cancers. It needs to be emphasised that all these results are highly tentative since they are based on ***notified*** cancer occurrences and hence are very uncertain proxies for true cancer incidence. Based on incidence rates from the Singapore Cancer Registry (1978-1982), the expected number of incident cases in 1989 for Penang (Malays, Chinese and Indians combined) was 1,561. The number notified to the National Cancer Registry was 496. This underlines the tentative nature of this analysis of the returns for 1987-1990 from Penang.

Key Words: Cancer epidemiology, Population-based cancer registry

Introduction

The National Cancer Registry of Malaysia (NCRM) was established in 1987 by the Ministry of Health with the aim of comprehensive registration of all cancer patients diagnosed in Malaysia. It was hoped that a more complete picture of the cancer burden in the country would emerge than was hitherto available from government hospital admissions and mortality records[1]. This would provide an essential input for policy and planning initiatives to meet the country's changing health and medical needs. Routine cancer registration would also allow for the monitoring of trends in cancer incidence and help in identifying priority areas for further investigation and control measures.

In 1990, the National Cancer Registry began distributing forms and instruction manuals to hospitals throughout the country to request notification of cancer cases diagnosed and/or treated at their facilities from 1987 onwards (Guideline Manual, NCRM)[2]. The Registry's records are thus built up through passive case detection, i.e. voluntary reports from hospitals and at this point, are not supplemented by active case searching of pathology reports, hospital discharge records or death certificates.

The present report analyses cancer notifications for 1987-1990 furnished by Penang public and private hospitals to the National Cancer Registry of Malaysia. This is a first attempt at describing the epidemiological profile of cancer occurrence for a defined population in Malaysia. *The numbers and incidence rates reported here pertain to* ***notified*** *cancer occurrences. They are very uncertain proxies for true cancer incidence until the completeness and reliability of information furnished to the National Cancer Registry is assessed. Indeed, one of the main aims of this preliminary analysis is to help identify areas which could be strengthened to ensure more complete and reliable collection of data on a routine basis.*

Materials and Methods

All cancer cases reported to the NCRM between 1987-1990 from hospitals in Penang state were obtained. Data entry from the original notification forms was done using DBASE IV data management software. DBASE IV lacks the built-in data verification routines of the CANREG package[3], but compensates by having a more flexible and broader range of data management utilities. Random checks were carried out for data entry errors. The data was processed and then exported to LOTUS 123 (release 3.1) and EXCEL (version 4.0) for further data processing, analyses and graphic productions.

Incident cases from Penang were defined as cancer cases with a Penang residential address indicated on the notification form. Non-Penang residents were excluded from subsequent analyses. Cancer cases whose initial diagnoses were made earlier than 1987 were also excluded. Multiple reports for individual cases were detected using the NRIC number as a unique identifier. For the few (5) cases whose primary site of cancer was unstated or uncertain, the first-mentioned site was taken as the primary site.

Population data for Penang state (1987-1989) was available from Jabatan Perangkaan Malaysia (Dept. of Statistics Malaysia, Penang branch). Population statistics for 1990 are still being compiled. The available data was disaggregated by gender, ethnicity and five-year age intervals. Age-standardised incidence rates (world population reference, Doll *et al.*,[4]) for the major anatomical sites for 1987-1989 were calculated for gender and ethnic sub-groups. These were compared with corresponding rates from the Singapore Cancer Registry, available for 1978-1982[5]. By applying the Singapore rates to the Penang population adjusted for age and ethnic composition, the expected number of incident cases for Penang was compared to the number actually notified to the National Cancer Registry.

Results

The population of Penang, approximately 1.2 million, is served by a number of public and private institutions which offer a variety of cancer-related services ranging from educational to diagnostic and treatment, to home visiting and hospice care. The current practice of the National Cancer Registry is to request notification of cancer cases from public and private hospitals.

Eligible Penang Incident Cancer Cases

For the years 1987-1990, 2,124 cancer cases were notified to the National Cancer Registry from Penang. Of these, 35 patients had out-of-state residential addresses and were excluded from the subsequent analyses. Also excluded were 186 cases whose initial diagnoses occurred prior to 1987, and 64 cases whose dates of incidence were unspecified, among them 10 cancers of the breast and seven each of cancers of the cervix, lung and nasopharynx. Seventy-seven cases were duplicate counts for the same individuals originating from different institutions in Penang. The remaining 1,762 patients are shown by year of first diagnosis (i.e. year of incidence) in Figure 1.

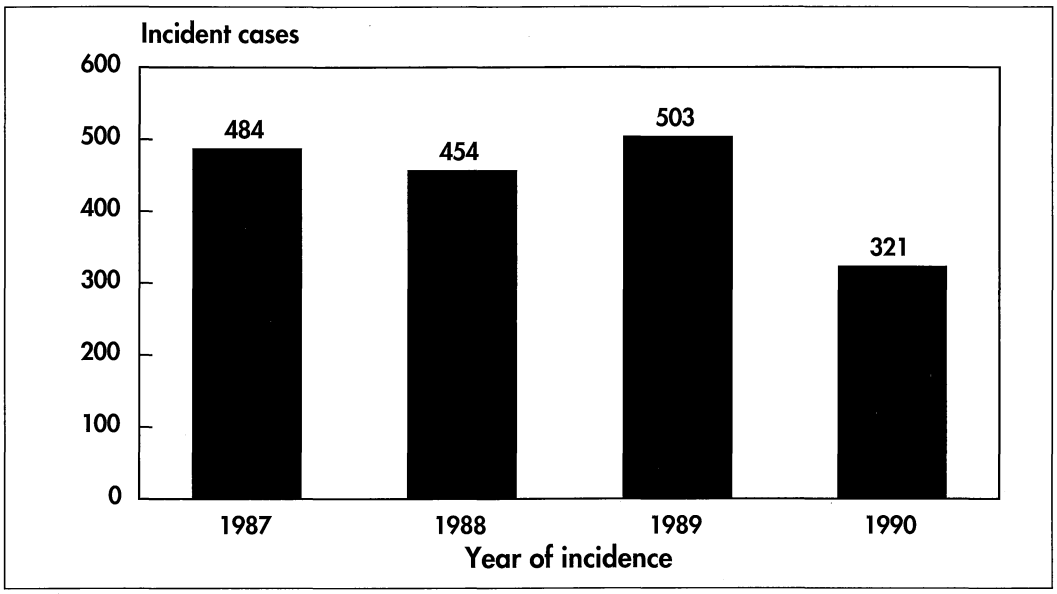

Fig. 1: Penang cancer cases (1987-1990) notified to National Cancer Registry

Reporting Institutions

As of 1990, there were two public and five private hospitals operating in Penang:

- Penang General Hospital (public)
- Bukit Mertajam District Hospital (public)
- Mount Miriam Hospital (private)
- Gleneagles Medical Centre (private)
- Penang Specialists' Centre (private)
- Penang Adventist Hospital (private)
- Lam Wah Ee Hospital (private)

Eighty-five per cent of cases reported from Penang were from Mount Miriam Hospital (Fig. 2). This 40-bed cancer referral hospital is one of two institutions in northern peninsular Malaysia which offer radiotherapy, the other being in Ipoh. Chemotherapy is also available here, but not surgical treatment of cancers. The Penang General Hospital and Gleneagles Medical Centre accounted for most of the remaining case notifications. No reports were received from Lam Wah Ee Hospital. All patients treated at Mount Miriam were diagnosed at other institutions before

being referred there for treatment. The low rate of multiple reports for a given patient thus indicated that reports were coming in primarily from this treatment centre and to a much lesser degree, from the institutions where the initial diagnoses were made or confirmed.

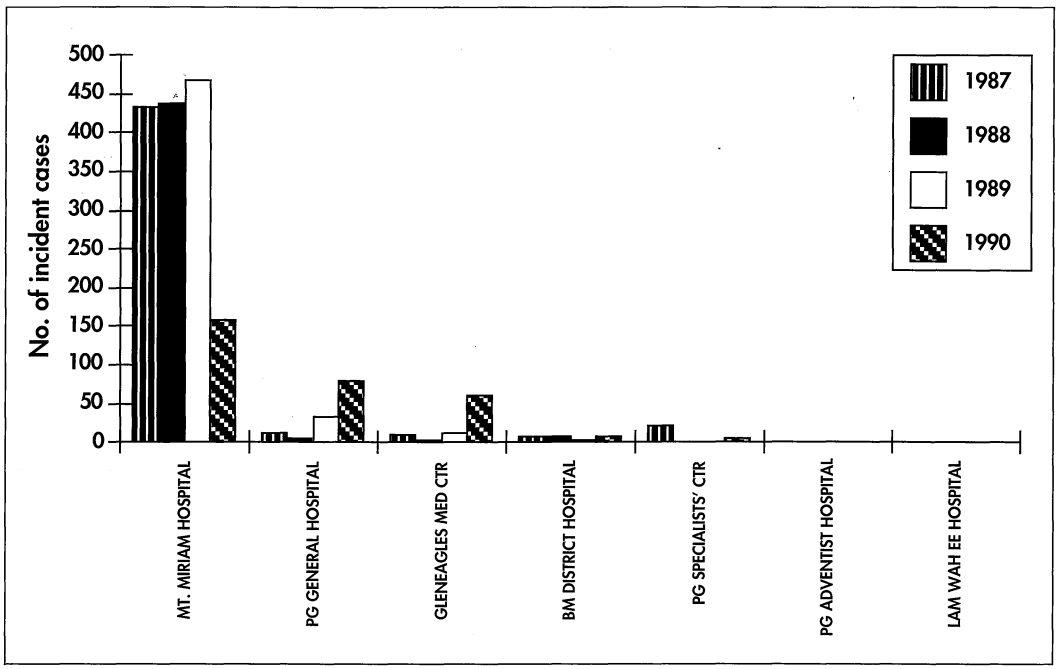

Fig. 2: Penang cancer cases (1987-1990) by hospital source of notification

Gender and Ethnic Distribution of Reported Cancers

The overall burden of reported cancers in Penang looked quite balanced between the two sexes. The male crude incidence was 41.2 per 100,000 per year, versus a female crude incidence of 45.7 per 100,000 per year (all-site cancers, 1987-1989).

Penang Chinese, comprising 52.9 per cent of the state's population, accounted for 72.1 per cent of all cancers reported for the period 1987-1990. Age-adjusted incidence rates for Malay, Chinese, and Indian male and female sub-groups showed substantial gender and ethnic variations for site-specific cancers (Figs. 3 & 4). For all-site cancers, the age-adjusted incidence rate was 74.4 per 100,000 among Chinese males, 22.3 among Malay males and 64.5 among Indian males. The corresponding rates for Chinese, Malay and Indian females were 70.2, 24.6 and 91.3 per 100,000 respectively.

With the exception of Indian female cancer incidence, the rank order by race in Penang is consistent with the rank order seen in Singapore. Among Singapore males, the age-adjusted incidence for all-site cancers was 282.1 per 100,000 for Chinese, 120.6 for Malays and 156.5 for Indians. Among Singapore females, the corresponding rates were 182.7, 113.8 and 174.6 per 100,000[5].

The high rank order for Penang Indian females is noteworthy. This however could be an artefact of differential, incomplete reporting. The relatively high incidence among Indian females was contributed largely by cervix, breast, mouth and lung cancers.

Overall, the four most frequently reported anatomical sites were breast, lung, cervix and nasopharynx cancers. For the separate sex-race strata (Figs. 3 & 4), the common cancers are as shown in Table I:

Table I
Most frequently reported cancers

CHINESE		MALAY		INDIAN	
Male	**Female**	**Male**	**Female**	**Male**	**Female**
lung	breast	lung	breast	lung	cervix
NPC	cervix	bladder	cervix	larynx	breast
larynx	lung	rectum	lung	esophagus	mouth
rectum	NPC	NPC	rectum	rectum	lung

The site-specific pattern of cancer reported from Penang thus has two main characteristics:

a) a transitional pattern between that typical of less industrialised countries (frequent sites: stomach, cervix, lung) and a pattern more characteristic of industrialised countries (lung, breast, rectum)

b) this is overlaid with cancers peculiar to particular ethnic groups (e.g. nasopharyngeal carcinoma among the Chinese, mouth cancers among the Indians).

The median ages at diagnosis of the various cancers are shown in Table II.

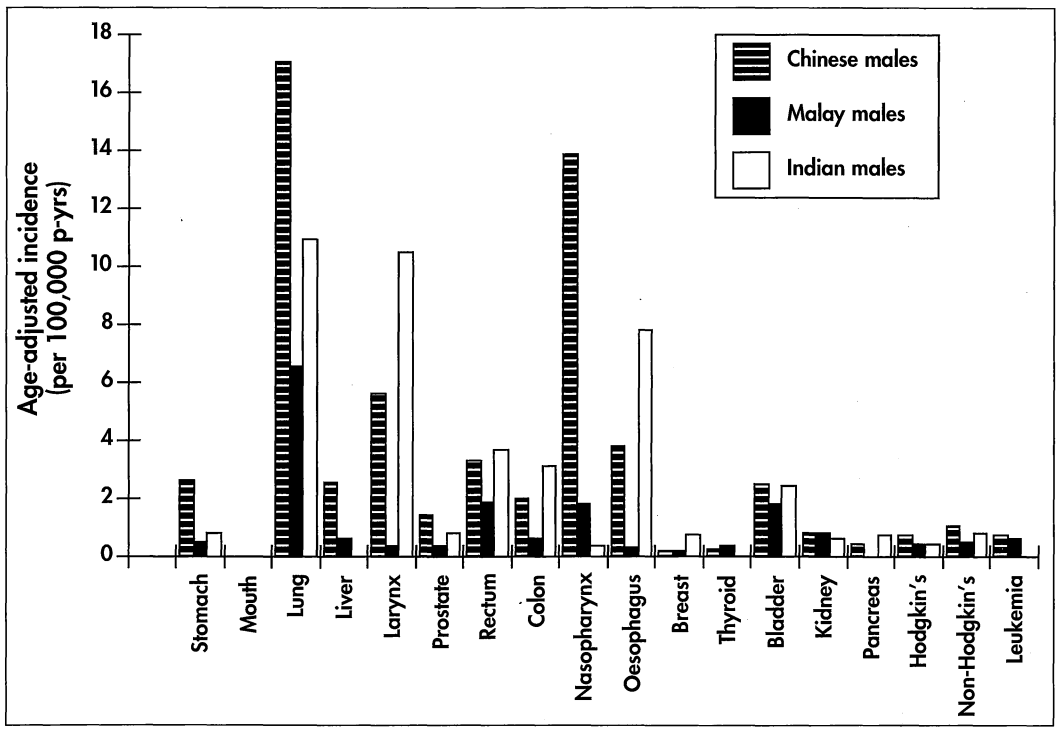

Fig. 3: Incidence of reported cancers among Penang males by site and ethnic group (1987-1989)

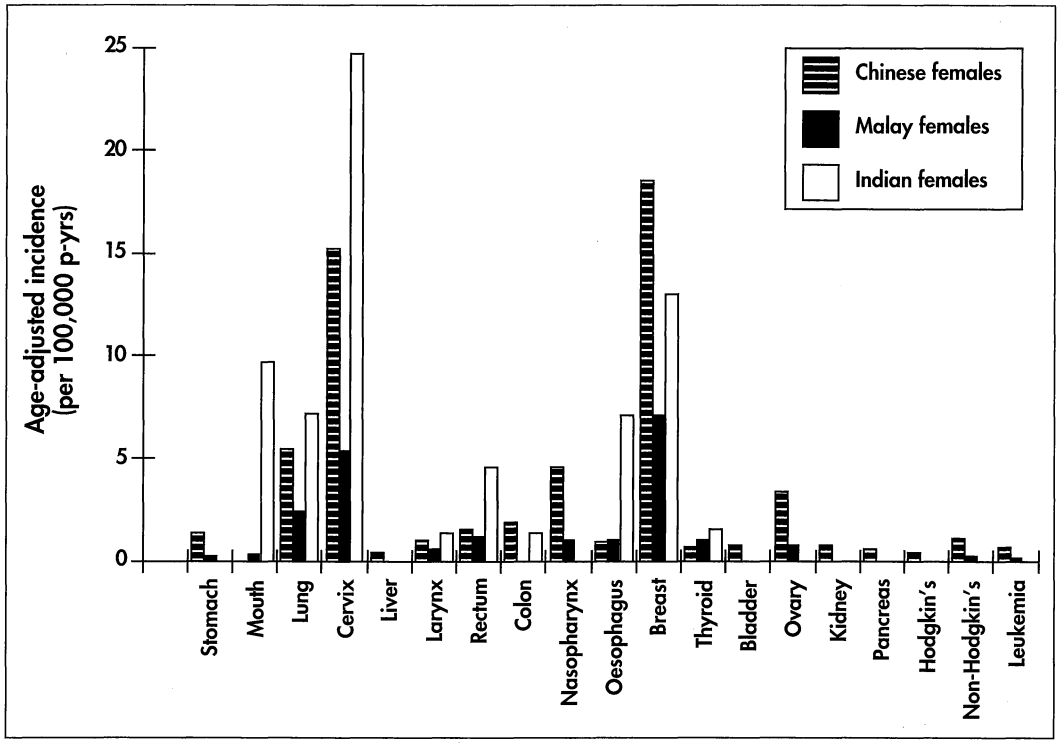

Fig. 4: Incidence of reported cancers among Penang females by site and ethnic group (1987-1989)

Stage at Diagnosis

Beginning in 1990, the new NCRM cancer notification forms requested information on the stage of disease at time of diagnosis. The following categories were used:

Stage 0 :	carcinoma-in-situ
Stage 1 :	restricted to primary organ or tissue of origin
Stage 2 :	local extension beyond primary organ/tissue of origin
Stage 3 :	lymph node involved
Stage 4 :	remote metastasis present

For 1990, all sites combined, Penang patients were evenly distributed between stages 1 - 4 (Table III). Of special interest are the few cancers for which screening and early detection is feasible and of proven value[6,7], e.g. breast and cervical cancer. Sixty per cent of breast cancers in Penang were diagnosed at stage 3 or above, i.e. with lymph node involvement or distant metastases. Clearly, there is scope for improvement through campaigns for breast self-examination and perhaps mammography. More encouragingly, the majority of cervical cancers (92%) were diagnosed at stage 2 or earlier, due perhaps to effective use of Pap smears and patients' awareness and attentiveness to early symptoms.

Among the incident cases for 1990, histology of the primary site was the most valid basis of diagnosis for the majority of patients (78%). Another 5 per cent were diagnosed based on histology

of metastases. The remaining diagnoses were based on clinical examination and investigation or exploratory surgery.

Discussion

Based on Singapore's age-specific cancer incidence rates for the various ethnic groups (1978-1982) (all-sites), the expected number of incident cases for Penang for each sex-race stratum in 1989 were calculated and are shown in Fig. 5. This of course assumes that Singapore's cancer rates, lagged by a decade, provide a reasonable approximation for true cancer incidence in Penang. For 1989, the combined tally of Malay, Chinese and Indian incident cases notified from Penang was 496, i.e. about a third of the expected number, 1,561. With this potential for under-reporting, any discussion or comparison of incidence rates is hazardous and is necessarily quite tentative.

In particular, the pattern of cancers reported from Penang largely reflects the pattern of cancer cases seen at Mount Miriam Hospital, since this hospital accounted for 85 per cent of Penang's

Table II
Median age at diagnosis for site-specific cancers (Penang, 1987-1989)

MALES	All Ages	Age??	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Median Age Dx
Stomach	20	0	0	0	0	0	0	1	1	1	4	1	1	1	4	6	59.5
Lung	128	0	0	0	0	0	0	0	1	1	8	6	10	20	18	63	64.0
Liver	20	0	0	0	0	0	1	0	2	1	3	2	1	1	1	8	54.5
Larynx	50	0	0	0	0	0	0	0	1	0	4	4	3	8	9	21	62.5
Prostate	10	0	0	0	0	0	0	0	0	0	0	0	1	0	2	7	70.0
Rectum	32	0	0	0	1	0	0	1	1	0	1	5	2	2	5	14	62.5
Colon	18	0	0	0	0	0	0	0	0	1	0	3	2	1	4	7	62.5
Nasopharynx	118	1	0	0	0	0	0	5	17	9	26	22	14	11	5	8	45.0
Oesophagus	36	0	0	1	0	0	0	0	0	1	0	0	3	5	5	21	68.0
Breast	3	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	47.5
Thyroid	3	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	57.5
Bladder	24	0	0	0	0	0	0	1	0	0	1	0	2	3	3	14	68.0
Kidney	9	0	0	0	0	0	0	0	0	0	1	3	1	2	1	1	52.5
Pancreas	3	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	62.0
Hodgkin's	7	0	0	0	0	0	1	1	0	0	0	1	0	1	1	2	57.5
Non-Hodgkin's	11	0	1	0	0	1	1	0	0	0	3	1	0	0	1	3	44.0
Leukemia	10	0	2	3	1	1	0	3	0	0	0	0	0	0	0	0	9.5
All Sites	667	3	5	6	4	9	10	19	25	22	57	63	55	75	84	228	58.0

FEMALES	All Ages	Age??	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Median Age Dx
Stomach	11	0	0	0	0	0	0	0	0	1	1	0	3	1	3	2	57.5
Lung	41	0	0	0	0	1	0	0	1	0	0	3	4	3	11	18	63.0
Cervix	167	0	0	1	0	0	0	1	6	15	20	29	22	19	25	29	52.5
Liver	3	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	58.0
Larynx	11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	10	70.0
Rectum	20	0	0	0	0	0	0	0	1	0	1	1	4	1	6	6	61.0
Colon	16	0	0	0	0	0	0	0	0	0	1	2	3	2	2	5	59.0
Nasopharynx	44	1	0	0	0	0	0	1	2	7	7	6	4	7	4	4	48.0
Oesophagus	18	0	0	0	0	0	0	0	0	0	0	2	3	1	5	7	63.0
Breast	196	1	0	0	0	0	0	2	12	21	28	26	33	22	17	34	51.0
Thyroid	12	0	0	0	0	0	0	0	1	1	2	1	2	3	1	1	52.5
Bladder	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	70.0
Ovary	31	0	0	0	1	1	1	1	0	3	4	5	6	7	0	2	49.0
Kidney	6	0	0	0	0	0	0	1	0	0	0	0	1	2	0	2	57.5
Pancreas	4	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	62.5
Hodgkin's	3	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	52.5
Non-Hodgkin's	10	0	0	0	0	1	0	0	0	0	3	1	1	0	0	4	49.5
Leukemia	6	0	1	4	0	0	0	0	0	0	0	0	0	0	0	1	7.5
All Sites	755	2	4	8	3	9	5	9	27	56	76	92	98	90	102	171	54.0

Table III
Stage at diagnosis for site-specific cancers (Penang, 1990)

Site	Total	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4
Stomach	13	1	4	3	2	3
Lung	93	2	26	34	8	23
Cervix	24	4	6	12	1	1
Liver	8	0	1	2	1	4
Larynx	6	0	0	1	5	0
Prostate	2	0	0	0	1	1
Rectum	12	0	4	2	4	2
Colon	9	0	6	1	2	0
Nasopharynx	20	2	0	5	9	4
Oesophagus	13	6	2	1	1	3
Breast	51	0	11	9	21	10
Thyroid	4	0	0	3	1	0
Bladder	2	1	1	0	0	0
Ovary	6	0	2	2	1	1
Kidney	0	0	0	0	0	0
Pancreas	4	0	2	0	0	2
Hodgkin's	1	0	1	0	0	0
Non-Hodgkin's	5	0	1	3	1	0
Leukemia	4	2	1	0	0	1
All Sites	319	23	78	84	67	67

Stage 0 : carcinoma-in-situ
Stage 1 : restricted to primary organ or tissue of origin
Stage 2 : local extension beyond primary organ/tissue of origin
Stage 3 : lymph node involved
Stage 4 : remote metastasis present

case notifications. Since Mount Miriam offers only radiotherapy and chemotherapy on referral, the pattern of cancers seen here may be biased in the following ways:

a) early stage cancers which are treated solely by surgery would be under-represented (e.g. stomach, skin (melanoma), and breast cancers), so that stage-at-diagnosis information for such cancers would be biased towards the later stages.

b) malignancies which are not treated with radiotherapy may also be under-represented especially when chemotherapy is available from other treatment centres in Penang (e.g. for childhood leukemias).

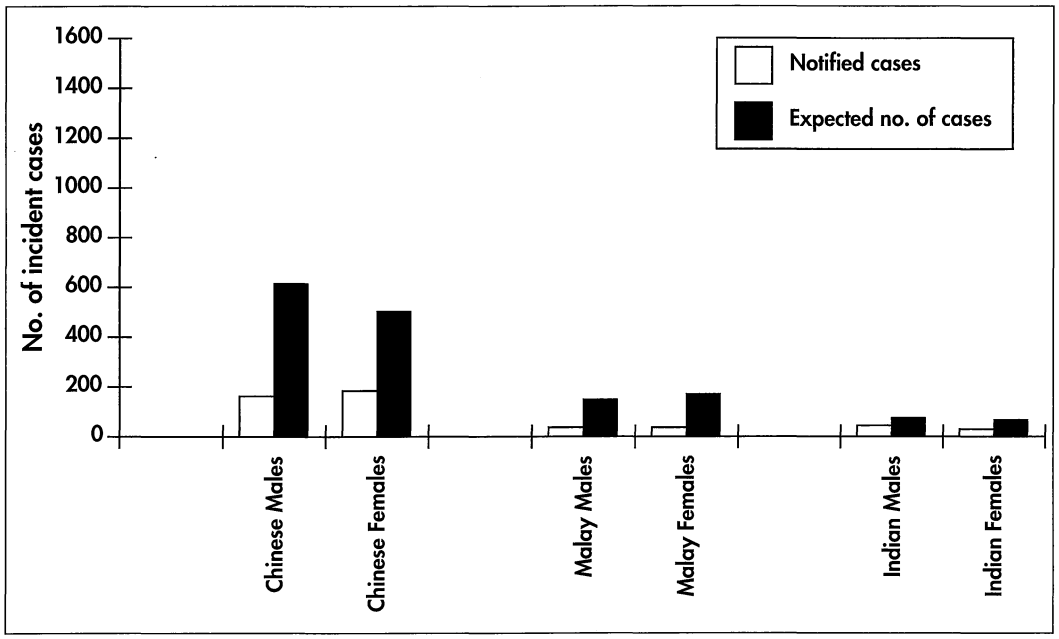

Fig. 5: Penang cancer cases (1989) notified vs. expected number of cases

c) malignancies requiring radiotherapy would be well-represented e.g. nasopharyngeal carcinoma and oral cavity cancers.

d) upper and upper-middle class patients are not well-represented among Mount Miriam's clientele. Malays are also proportionately under-represented. Consequently malignancies associated with social class (e.g. cervical cancer) or ethnicity (e.g. nasopharyngeal carcinoma, mouth cancer) may not appear in the proportions that would properly reflect statewide patterns.

When compared against the expected number of incident cases for 1989 (Fig. 5), the deficit of Penang case reports thus reflects the uneven reporting among different hospitals in combination with the different clientele that the hospitals served. The deficit was largest for Malay males and Malay females, and least for Indian males and females. By anatomical site, the largest differences between Penang and Singapore rates were seen for stomach, lung, liver and colorectal cancers.

Finally, if Mount Miriam Hospital has been reporting all or most of the cases receiving treatment there, there are likely to be many more patients diagnosed and treated at other Penang institutions who were not notified to the National Cancer Registry. It is quite possible there are significant numbers of Penang residents who are diagnosed in Penang but are subsequently treated outside the state, and a smaller number who are both diagnosed and treated out-of-state.

A check on this was possible for nasopharyngeal carcinoma (NPC), using a database of NPC patients treated at the Institute for Radiotherapy, Oncology & Nuclear Medicine of Hospital Besar, Kuala Lumpur (HBKL). Of 276 NPC patients treated at this institute who had been initially diagnosed in 1987, only two had Penang residential addresses, and two other non-Penang residents were referred from Penang medical institutions. For incident cases in 1988, there were 256 NPC patients treated at HBKL, of whom only one was a Penang resident. Two others were

referred from Penang institutions. We have no information however on Penang-resident patients who may be diagnosed and/or treated at other institutions in or out of the country.

Conclusion

The most important conclusion from the above analysis is that if the degree of under-reporting of cancer cases suspected in Penang is of comparable magnitude or worse nationwide, we have not made much progress in ascertaining the true magnitude of the cancer problem for purposes of policy and planning.

The experience of cancer registries worldwide suggest that *national* cancer registries are most feasible in countries with well-developed health and social infrastructure in which the state organises and provides effective, universal coverage of medical services for all its citizens (Jensen *et al.,* 1991). Such national health infrastructures invariably include the kind of medical information systems crucial to an effective national cancer registry. The Scandinavian countries and Britain are examples of such countries. Singapore's experience in cancer registration would be difficult to replicate – it is a highly urbanised, compact city-state with well-developed health infrastructure and the administrative means for ensuring good compliance. Even so, it has to rely on active case searching to supplement the voluntary reports by medical practitioners which furnished only about half the incident cases.

The goal of comprehensive cancer registration for Malaysia would therefore be best achieved through a strategy of regional cancer registries where active case searching can supplement voluntary notifications to provide reliable incidence data. The regional registries could be located so as to cover the spectrum of environmental and social conditions encountered in Malaysia.

Acknowledgments

We wish to thank the Director-General of Health for permission to publish this paper. The National Cancer Society of Malaysia (Penang branch) provided generous support for data-entry and programming assistance and purchase of computer accessories. Chuah Yong Huat's dedication and skills in database programming is gratefully acknowledged.

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