Herald Journal of Geography and Regional Planning Vol. 2 (1), pp. 048 - 055 April, 2013
Available online: http://www.heraldjournals.org/hjgrp/archive.htm

Full length Research Paper

Intra-urban pattern of cancer morbidity and the associated socio-environmental factors in Ile-Ife, South-western Nigeria

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Accepted March 09, 2013

An analysis of cancer morbidity pattern was conducted in Ile-Ife city, with the aim of identifying the associative factors. Retrospective cancer cases from 1987 to 1996 were retrieved from the national cancer registries of tertiary hospital located in the city. The information on age, sex, cancer site and residential area of cancer patients was used to portray demographic and geographical distribution of cancer morbidity. Furthermore, questionnaire was administered to residents of sampled residential areas in order to elicit information on socio-economic, behavioural and environmental characteristics of selected areas. Out of the 2027 cases reported at Ife/Ijesha registry within the study period, breast cancer was the highest, followed by bone and glandular cancer (15% – 17%). Cancer cases vary significantly among age-groups with concentration among 46–60 years. Apart from high burden of cervical and breast among females, they equally reported higher cases of all cancer groups. Breast, prostate, gastro-intestinal, liver and skin cancers were higher in relatively modern areas while low socio-economic areas had significant proportions of urinary, gastro-intestinal and cervical cancers. Regular use of kerosene stove, alcohol consumption, indices of nativity and low socio-economic status showed significant correlation with selected cancer groups (P<0.05). Intervention programmes for cancer control should take cognizance of these variations at community level.

Keywords: Associative analysis, disease pattern, health transition urban health

INTRODUCTION

Studies on the spatial epidemiology of cancer generally showed urban dominances of cancer cases over the rural areas. Though urban areas showed higher cases of cancer morbidity and mortality, the patterns are uneven among the various areas within the cities. In Nigeria for instance, the urban elites have been recognized as higher carriers of cancer burden (Learmonth, 1988; Iyun, 1995). This disparity in cancer occurrence is adduced to prevalence of several practices that predispose "westernizing" urban residents in developing countries to cancer initiation (Chiu et al. 2003; Ghumare and Cunningham, 2007).

Cancer morbidity has become significant in developing countries as a consequence of increasing life expectancy, mobility and changes in population nutrition (Tandhanand et al. 1984). According to Popkin (2004), dietary shift from indigenous meals to complex meal rich in fat, caloric sweeteners and animal-source food is a precursor of many degenerative diseases in communities. Hence, the gradual but significance transition in causes of morbidity and mortality from communicable and infectious diseases to non-communicable ailments (Iyun, 1992).

Variations in cancer health among population groups and geographical areas are generally attributed to modifiable and non-modifiable risk factors. As indicated by previous studies, non-modifiable risk factors associated with the occurrence of breast, gastric and ovarian cancers include family history, hormonal factors, parity, age and sex among others (Anteby *et al*. 1983; Pathak and Whittemore, 1992; Colditz, *et al.*1993; Slattery and Kerber, 1993; Oluwasola and Ogunbiyi, 2003). Among modifiable or environmental risk factors linked with morbidity of colorectal, oral, liver, breast and

prostate cancers are consumption of high calorie of animal fat, low fiber diets, misuse of alcohol, smoking, physical inactivity and excessive body weight (Norie, 1992; Stein and Coldizt, 2004; Bosch *et al*, 2000). Exposure to infections and contaminants such as schistosomiasis, hepatitis B virus, human Papilloma virus, Helicobacter pylori, aflatoxins, nitrosamine, chronic ulcer, malnutrition, and ignorance are also implicated in the occurrence of liver, oral, skin, cervical cancer and lymphomas (Parkin, 2002; Olweny, 1990; Ojo, 1992; Olubuyide, *et al*. 1993; Ebert and Malfertheiner, 2002; Ochicha, 2004; Mills, 2005; Nggada, *et al*. 2003; Oji and Chukwuneke, 2006; Alatise *et al.* 2007; Tornesello, *et al*. 2007).

Studies on the spatial analysis of cancer morbidity within cities are very scarce in the sub-Sahara African countries including Nigeria. Moreover, there is paucity of relevant information on the associated risk factors that explain the observed spatial variation between residential areas. This gap in cancer research may account for the seemingly intractable nature of the disease in spite of huge investment and advances in medical technology.

According to Pastides (1995) and Bonita et al. (2006), the design of analytic studies which evaluate cancer risk factors should be preceded by cancer cases distributed among geographic, temporal and demographic units. Moreover, spatial analysis of cancers is equally indispensable for indicating the interplay of environmental and genetic factors (Anteby, 1983).

In the present study, the pattern of cancer morbidity among geographical areas in Ile-Ife city was analyzed with the aim of identifying the associated socio-economic and environmental factors. A spatio-associative approach was adopted; using cancer morbidity data documented in Ile-Ife city over 10 year period. The concept of environmental risk cells (Shannon and Spurlock, 1976) which interprets indicators of ill-health by considering different living conditions and lifestyles of a population provides the framework for this study. It is therefore hypothesized that variations in cancer morbidity and prevalence among geographical units would be explained by differences in the socio-economic status of residents and environmental qualities of such areas.

METHODOLOGY

The Study Area

Ile-Ife, an ancient city in western Nigeria is 86 kilometers away from Ibadan which served as the capital of the then Western region of the country. It is located on latitude 7°28'–7°30' North and longitude 4°27'–4°35' East. The city serves as the headquarters of Ife central Local Government Area of Osun state. Ile-Ife is a medium-sized city with a population of 186,825 in 1996 (NPC, 1997); since then there has been significant increase in population leading to rapid spatial expansion. Major occupations of the residents are civil service, trading and farming.

Ile-Ife has an urban structure similar to the concentric model proposed by Park and Burgess (HGA, 2000). The innermost area houses the palace of the traditional ruler and most of the indigenes. The second zone is the transitional (high density) areas which consist of a mixed population of the indigenous people and migrants. The outermost zone is the sub-urban area which houses the elites, characterized by low population density.

The city of Ile-Ife was selected for the current study because it has a cancer registry besides its' manageable area which is suitable for a micro-scale investigation. Ile-Ife cancer registry is a community based registry that oversees cancer activities in the Ife/Ijesha zone of South-West Nigeria. It was established in 1989 to register cancer cases of patients obtaining care at the Obafemi Awolowo University Teaching Hospital Complex and those on referral to the hospital from other health facilities within the zone.

Data collection and analysis

The first category of data collected for this study was retrospective cancer cases from 1989 to 1996 from Ile-Ife cancer registry. After the study proposal was cleared of ethical implications by the Ethical Committee of the hospital, information on age, sex, occupation, diagnosed cancer type and the residential area (not building addresses) of the patients documented at the registry was extracted manually. Out of 543 cancer cases reported by Ile-Ife residents, only 380 cases with adequate information were analysed in this study.

According to WHO classification of diseases, cancer sites ranged from *T140* to *T209* (ICD 9th edition). Due to the unwieldiness of analyzing 65 cancer sites, 14 cancer groups (excluding ill-defined sites) similar to Verhasselt and Timmermans (1987) classification were adopted in this study. The cancer groups are breast (*T174,175*), glandular (*T193,194,196*), gastro-intestinal (*T150–154*), cervical (*T179–184*), prostate (*T185–187*), bone (*T170,171*), liver (*T155*), skin (*T172,173*), internal organs (*T156–158,163,164*), oral (*T140–149*), urinary (*T188,189*), eye (*T190*), respiratory (*T160-162*), and leukemia/lymphoma (*T200–208*). Few cases of oral, eye, leukemia/lymphoma and respiratory cancers found in the record were regrouped as "others".

Secondly, primary data were collected in Ile-Ife with the aid of pre-tested questionnaire and field observation from the old administrative wards which were operational till 1997. The questionnaire consisted of questions on housing and general environmental conditions, waste dump sites, possession of modern facilities, dietary preference, sources and handling of drinking water, level of education, income, occupation, family size, age and

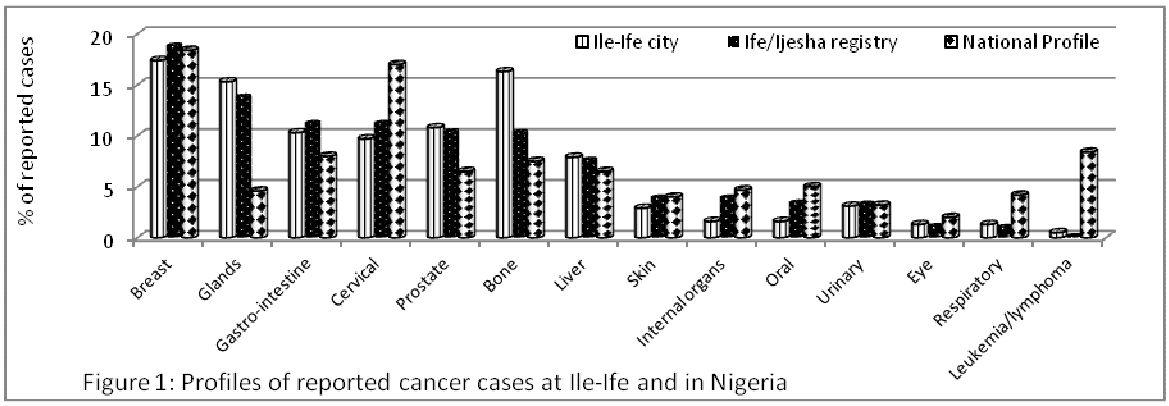

Figure 1. Profiles of reported cancer cases at Ile-Ife and in Nigeria

sex among others. These characteristics were employed as proxy for socio-economic, behavioural and environmental variables for explaining the spatial pattern of cancer groups in Ile-Ife city.

In order to achieve randomness in the selection of residential areas and respondents, the city was divided into cells of 500 m^2. Cells were selected randomly using the random number table; in each cell 13 male and female household heads were sampled systematically and interviewed. In all, 14 cells were chosen out of which 150 respondents with adequate information on their questionnaires were recruited. Questionnaire information from cells found in each of the seven administrative wards was used to generate variables for each ward. Twenty variables were generated from the questionnaire responses and employed as explanatory variables in the subsequent analysis.

Data analysis

Frequency run, percentage and mean were employed to summarize the cancer cases and responses from the questionnaire interview. The incidence rate of all cancer cases (CIR) among the wards was computed using the formula: $CIR_{ward} = (n_{ij}/p_{ij} * k)$; where n_{ij} is reported cases of cancer per ward; p_{ij} stands for the population of each ward; k represents a constant (10,000).

The 20 variables generated from questionnaire interview were employed to explain the cancer pattern within the city. Correlation statistics was employed to examine the association between cancer occurrence among the wards (y) and the socio-economic, behavioural and environmental variables (x). Only 13 of the explanatory variables that showed significant correlation with at least one cancer group and equally passed the collinearity diagnostic test ($r < 0.96$)are presented in the results section.In order to quantify the explanation of ward cancer pattern (y) by 13 variables (x), regression analysis was employed. The regression equation is of the form: $Y = a + b_1X_1 + b_2X_2 + b_3X_3$; where *a* stands for intercept of model slope and *b*, the quotient of the explanatory variables. All the analyses were conducted in Statistical Package for the Social Sciences (IBM® SPSS) version 20 with confidence level set at 95%.

RESULTS

Out of 2092 cancer cases documented at Ife/Ijesha cancer registry between 1989 and 1996, 543 cases (26%) were reported from Ile-Ife. Cancers of the breast, glandular, gastro-intestinal, cervical and prostate were the five top cancer groups reported at the registry with 1186 cases, accounting for 65% of all cases (Figure 1). These cancer groups accounted for 66% of cancer cases reported by residents of Ile-Ife city. Apart from bone, internal organs and oral cancers that showed noticeable difference between the reported cases in the zone and Ile-Ife city, other cancer groups had similar proportions of occurrence.

Comparing the cancer profile of the zone with the national profile, the percentage of cervical, respiratory and leukaemia/lymphoma were outstandingly higher than the proportion of cases in Ife/Ijesha zone. Conversely, the percentage occurrence of glandular and bone cancer are substantially higher at Ife/Ijesha zone (14%, 10%) compare with the national cancer profile (5%, 8%).

Patients aged 46–60 reported the highest cases of cancer groups (28%), closely followed by those that were above 60 years (27%) while patients below 16 years were the least (10.4%). As shown in Table 1, patients aged 40–60 had the highest cases of all cancer groups except prostate, skin and urinary cancers. Cases of glandular, bone, urinary and internal organs cancers were high among patients aged 0-15.

Aside breast, cervical (female) and prostate (male) cancers that are gender specific, males accounted for higher proportion of almost all other cancer groups in Ife/Ijesha zone. Generally, cases of cancer groups showed significant variation among the age-groups

Table 1. Demographic characteristics of cancer groups in Ife/Ijesha zone

Cancer group	Age group (years)					Gender		Total	%age
	Below 16	16–30	31–45	46–60	Above 60	Male	Female		
Breast	3	38	121	116	62	1	350	351	16.8
Glandular	41	41	46	77	45	142	115	257	12.3
Gastro-intestinal	6	29	42	62	64	112	94	206	9.8
Cervical	6	29	59	58	50	0	208	208	9.9
Prostate	3	10	3	41	134	194	0	194	9.3
Bone	38	26	38	44	40	83	105	188	9.0
Liver	8	18	35	52	27	82	60	142	6.8
Skin	1	10	10	16	34	39	34	73	3.5
Internal organs	10	8	13	19	16	43	25	68	3.2
Oral	7	13	11	19	11	40	23	63	3.0
Urinary	17	3	8	13	19	34	27	61	2.9
Eye	7	6	3	2	2	6	14	20	1.0
Respiratory	3	2	4	5	4	11	7	18	0.9
Leukemia/ lymphoma	0	0	0	1	1	0	2	2	0.07
Others	63	50	28	49	47	141	100	241	11.5
Total	213	283	421	574	556	928	1164	2092	100

and between the gender classes ($P<0.05$).

While cancer occurrence was highest in Iremo, followed by Modakeke wards, the pattern of incidence per 10,000 people was different. Ilare and city centre wards had the highest cancer incidence (>30 cases per persons) as shown in Figure 2. By percentage occurrence, liver, skin, breast and bone cancers were reported mostly from Iremo ward. Similarly, the cancer profile of Okerewe ward showed high cases of breast and prostate cancer (39%–50%). On the other hand, glandular, cervical and gastro-intestinal cancers were relatively high (26%–36%) in Modakeke ward. Ilare ward with similar profile to Modakeke had relatively higher cases of urinary, gastro-intestinal and cervical cancers (21%–33%).

(Table 2)There was significant negative association (Table 3) between the occurrence of breast cancer and the percentage of residents born in the city ($r =-0.81$; $P=0.03$). Conversely, percentage of residents that migrated more than 10 years into the city, lived in modern bungalow and had toilet fixed with water closet showed positive correlation ($r =0.60–0.68$; $P>0.05$).

Similar to breast cancer, the percentage of residents that had water closet toilet ($r =0.77–0.89$), used gas cooker ($r =0.77–0.83$) and resided in modern bungalows ($r =0.76–0.89$) were positively correlated with occurrence of prostate, gastro-intestinal, liver and skin cancers. On the other hand, the percentage of residents that used pit toilet ($r =-0.71– -0.87$) and that were born in the city ($r =-0.74– -0.75$) had significant negative correlation. Prostate and gastro-intestinal cancers had significant negative association with percentage of residents that earned below N1000 monthly, consumed alcohol regularly and depended primarily on kerosene stove for domestic cooking ($r =-0.72– -0.73$).

The spatial distribution of urinary, respiratory and overall cancer incidence showed positive association with the percentage of residents that used water closet ($r =0.83$), gas cooker ($r =0.83–0.90$) and the percentage of residents that migrated into the city between 1–10 years prior the study ($r =0.75–0.78$). Variable that showed significant negative relationship with urinary cancer and overall cancer incidence was the percentage of residents that used kerosene stove for domestic cooking ($r =-0.84– -0.89$). In addition, the overall cancer incidence had negative correlation ($P<0.05$) with the percentage of residents that resided in traditional mud houses, percentage that earned below N1000 monthly and the percentage that consumed alcohol regularly ($r =-0.72– -0.81$).

Only oral cancer showed significant positive relationship with the percentage of residents that lived in traditional mud houses ($r =0.71$). It had higher negative correlations with the percentage of residents that earned above N10001 monthly ($r =-0.81$) in the city.

Of all cancer groups, bone and glandular cancers had no significant correlation with any of the variables employed in the correlation analysis. These two cancer groups showed positive correlation with average room density of households ($r =0.58$) and negative association with percentage of residents using clay pot for domestic water storage ($r =-0.55$; $P> 0.05$).

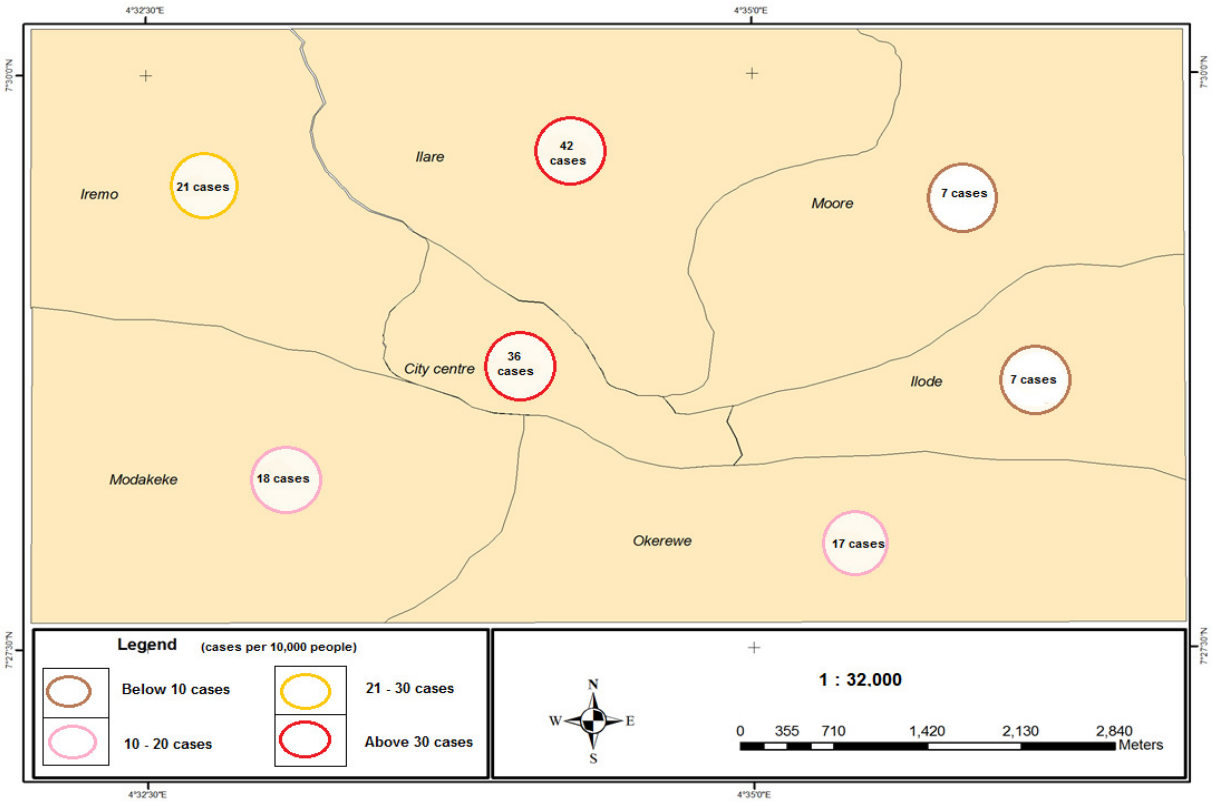

Figure 2. Pattern of cancer incidence among wards in Ile-Ife

Table 2. Distribution of cancer groups among wards in Ile-Ife city (1989–1996)

Ward	Breast	Bone	Glandular	Prostate	Gastro-intestinal	Cervical	Liver	Urinary	Skin	Others	All cases
City centre	5	5	4	2	1	3	3	2	0	4	29
%	*7.6*	*8.1*	*6.9*	*4.9*	*2.6*	*8.1*	*10*	*16.7*	*0*	*16.7*	*7.6*
Ilare	4	10	8	8	9	8	5	4	2	3	61
%	*6.1*	*16.2*	*13.8*	*19.5*	*23.1*	*21.6*	*16.7*	*33.3*	*18.2*	*12.5*	*16.1*
Ilode	3	2	6	2	2	3	0	1	0	1	20
%	*4.5*	*3.2*	*10.3*	*4.9*	*5.2*	*8.1*	*0*	*8.3*	*0*	*4.2*	*5.3*
Iremo	26	16	9	10	10	9	15	3	5	6	109
%	*39.4*	*25.8*	*15.5*	*24.4*	*25.6*	*24.3*	*50*	*25*	*45.5*	*25*	*28.7*
Modakeke	16	15	21	9	10	11	4	1	2	6	95
%	*24.2*	*24.2*	*36.2*	*22*	*25.6*	*29.7*	*13.3*	*8.3*	*18.2*	*25*	*25.0*
Moore	4	8	5	5	3	1	1	1	1	3	32
%	*6.1*	*9.8*	*8.6*	*12.2*	*7.7*	*2.7*	*3.3*	*8.3*	*9.1*	*12.5*	*8.4*
Okerewe	8	6	5	5	4	2	2	0	1	1	34
%	*12.2*	*9.8*	*8.6*	*12.2*	*10.3*	*5.4*	*6.7*	*0*	*9.1*	*4.2*	*8.9*
Total	66	62	58	41	39	37	30	12	11	24	380

The selected socio-economic, behavioural and environmental variables explained between 58% (R^2 =0.58) and 92% (R^2 =0.92) of the distribution of cancer groups among the wards. Sixty-five percent of breast cancer occurrence among the domestic water storage (r =-0.55; P> 0.05).

percentage of residents born within the city. This variable equally explained 58% of eye cancer and 73% of overall cancer occurrence.

The ward distribution of liver and skin cancers we

Table 3. Correlation between cancer occurrence and selected socio-environmental variables

Cancer Occurrence	% residing in old mud houses	% residing in modern bungalows	% using water closet	% using pit latrines	% born in the city	% of 1-10yrs migrants	% of >10yrs migrants	% earning below N1000 monthly	% earning above N10001 monthly	% using gas cooker	% using kerosene stove	% drinking Well/ Borehole water	% consuming alcohol
Breast	-0.04	0.65	0.60	-0.57	-0.81*	0.17	0.63	-0.41	0.07	0.38	-0.23	0.11	-0.32
Bone	-0.21	-0.03	0.41	0.06	0.07	-0.19	-0.09	0.03	0.09	0.37	-0.23	-0.14	-0.35
Glandular	0.09	0.01	0.31	-0.19	-0.53	-0.1	-0.02	-0.36	-0.23	0.37	-0.23	-0.14	-0.35
Prostate	-0.27	0.76*	0.83*	-0.81*	-0.75*	0.49	0.36	-0.72*	0.34	0.77*	-0.68	0.44	-0.73*
Gastro-intestinal	-0.23	0.66	0.82*	-0.68	-0.69	0.41	0.16	-0.65	0.26	0.79*	-0.72*	0.32	-0.69
Cervical	-0.16	0.42	0.66	-0.45	-0.69	0.25	0.02	-0.56	0.03	0.71*	-0.63	0.14	-0.51
Liver	-0.32	0.86*	0.77*	-0.71*	-0.75*	0.50	0.58	-0.56	0.35	0.60	-0.54	0.42	-0.45
Urinary	-0.64	0.61	0.68	-0.53	0.36	0.77*	-0.01	-0.64	0.54	0.83*	-0.89*	0.65	-0.54
Skin	-0.36	0.89*	0.89*	-0.83*	-0.74*	0.53	0.59	-0.64	0.45	0.69	-0.58	0.45	-0.64
Oral	0.71*	-0.32	-0.38	0.25	-0.45	-0.52	-0.10	0.14	-0.81*	-0.28	0.25	-0.44	0.36
Eye	0.01	0.17	0.31	-0.25	-0.76*	0.15	-0.01	-0.52	-0.23	0.5	-0.48	0.11	-0.27
Respiratory	-0.39	0.18	0.08	-0.44	-0.39	0.40	0.75*	-0.55	0.30	0.11	0.07	0.51	-0.35
Others	-0.21	0.67	0.76*	-0.68	-0.85*	0.36	0.42	-0.66	0.18	0.68	-0.56	0.29	-0.58
Overall occurrence	-0.38	0.31	0.25	-0.31	-0.36	0.65	-0.16	-0.56	0.22	0.59	-0.74*	0.62	-0.28
Incidence /10,000	-0.81*	0.64	0.83*	-0.63	-0.38	0.78*	0.17	-0.75*	0.68	0.90*	-0.84*	0.64	-0.72*

Table 4. Regression of cancer morbidity among wards on socio-environmental variables

Regression model	R	R^2	% explanation	Estimate Error	Sig. level
$Y_{Breast} = 33.8 + 0.51X_{\%\ b.city}1$	0.81	0.65	65.0	8.383	0.028
$Y_{Prostate} = 3.15 + 0.29X_{\%\ uwc}2$	0.84	0.7	70.0	4.75	0.019
$Y_{Gastro\text{-}intestinal} = 0.33 + 0.37X_{\%\ uwc}3$	0.82	0.67	67.0	6.36	0.024
$Y_{Gastro\text{-}intestinal} = -1.704 + 0.614X_{\%\ uwc} + -0.711X_{ab10001}4$	0.96	0.92	92.2	3.45	0.023
$Y_{Liver} = -12.51 + 0.91X_{\%\ m.bung}5$	0.87	0.75	75.0	9.18	0.012
$Y_{Urinary} = 107.2 + -1.13X_{\%\ using\ k.stove}6$	0.90	0.802	80.2	5.61	0.006
$Y_{Skin} = -12.8 + 0.97X_{\%\ m.bung}7$	0.90	0.807	80.7	8.26	0.006
$Y_{Oral} = 20.14 + -0.99X_{\%\ ab10001}8$	0.82	0.667	66.7	8.07	0.025
$Y_{Oral} = 43.97 + -1.86X_{\%\ ab10001} + -0.61X_{\%\ c.alcohol}9$	0.97	0.934	93.4	4.00	0.016
$Y_{Eye} = 35.7 + -0.56X_{\%\ b.city}10$	0.76	0.579	57.9	10.75	0.047

b.city – born in city, uwc – using water closet, ab10001 – earning above N10001, m.bung – residence in modern bungalow, k.stove – kerosene stove, c.alcohol – consuming alcohol, g.cooker – gas cooker,

explained by the percentage of residents living in modern bungalows (75%, 80%; P<0.05). In the same vein, 70% of prostate cancer occurrence among wards was explained by the percentage of residents that lived in houses with water closet toilets. The same variable accounted for 67% of the variation in the occurrence of gastro-intestinal cancers. In addition, 25% of the occurrence of gastro-intestinal cancer was explained by the percentage of residents that earned above N10001 monthly. These two variables accounted for more than 92% of the variation in the occurrence of gastro-intestinal cancers among the wards.(Table 4)

The ward distribution of liver and skin cancers were explained by the percentage of residents living in modern bungalows (75%, 80%; P<0.05). In the same vein, 70% of prostate cancer occurrence among wards was explained by the percentage of residents that had water closet facility in their houses. More than 92% of the variation in the occurrence of gastro- intestine cancers was explained by percentage of residents living in houses with water closet (67%) and residents that earned above N10001 monthly (25%).

The percentage of residents that earned above N10001 monthly in each ward (67%) and the percentage of residents that regularly consume alcohol (27%) jointly explained more than 93% of the occurrence of oral cancer. While monthly income above N10001 is shown to be negative, consumption of alcohol is positive with oral cancer. Pattern of urinary cancer was explained by the percentage of residents that used kerosene stove primarily for domestic cooking (80%) in each ward.

DISCUSSION

The fairly uniform proportion of breast, gastro-intestinal, liver, skin, urinary and eye cancer occurrence in Ife/Ijesha zone and the country profile points to the commonality of risk factors of these cancer groups among the Nigerian population. Poor intake of micro-nutrient and vitamins, crave for low fibre diet among urban population which reduces the human immune system are risk factors of these cancers (Wardwell and Massion, 2005; Thompson et al. 2009; Reeve et al. 2007).

Higher percentages of glandular, prostate and bone cancers in the study area compared to the country profile may indicate the preponderance of practices and causative agents of these cancers in Ife/Ijesha zone. Conversely, low leukaemia/lymphoma occurrence may point to minimal exposure of the population in the zone to industrial pollution and pesticides (ACS, 2012; CRUK, 2012 and Greaves, 2000).

Cancer cases vary significantly among age-groups with concentration among 46–60 years and older people. This age characteristic agrees with the report of Garcia et al. (2007) that cancer cases occur more among people aged 55 and above in developing countries. However, the disparities observed in the age distribution of each cancer group was equally reported by Adeniji and Anjorin (2004), Ochicha et al. (2007) and WHO/ICO (2010) in the occurrence of liver, skin and cervical cancers.

Females carried higher burden of breast, cervical and overall cancer morbidity but lower burden others. In support of this finding, Garcia et al. (2007) reported higher cases of all cancers among females in West Africa. Higher occurrences of other non-gender specific cancers among men were reported by Ochicha et al. (2004), Nwokediuko et al. (2011), Adeniji and Anjorin (2004) and Oji and Chukwuneke (2007) in parts of Nigeria.

There was an observed difference in the occurrence of cancer groups among the wards in Ile-Ife city. Moreover, the overall cancer incidence showed bias for areas with predominantly modern and relatively high socio-economic residents. This finding agrees with the observations of Iyun (1995) and Chiu et al. (2003), that the urban elites carry higher burden of cancers associated with “westernization” of lifestyle.

The prevalent cancer groups in Iremo and Okerewe wards were those linked with high socio-economic

development unlike the profile in Modakeke and Ilare wards (Olweny, 1990, McGlashan, 1990). Cancers that are associated with under-development and poor hygiene were more common in Modakeke and Ilode wards, which are inhabited predominantly by relatively low socio-economic population groups. This finding is corroborated by Waterhouse et al. (1989) and MacKay et al. (2006) that common cancers in the developed societies are linked with high dietary fat, smoking and exposure to industrial pollutants while in the developing societies those induced by food contamination and infectious diseases are more prevalent.

Occurrence of breast, prostate, gastro-intestinal, liver and skin cancers among the wards had negative associate with proportion of native people and indices of lower socio-economic status. According to Davis et al. (1990) and Norie (1992), human consumption of excessive margarine, high fat and animal protein induces breast, colorectal and prostate cancers. Unaffordability of modern food, adherence to traditional diets and low exposure to indoor chemical may explain the negative association of the cancer groups with indices of nativity and low socio-economic status.

On the other hand, the positive association between oral cancer occurrence and low socio-economic status and frequent consumption of alcohol can be linked to consumption of locally brewed alcohol among low socio-economic people. This habit is capable of exposing them to contaminants owing to low quality of the locally brewed alcohol coupled with chewing of additives-laced tobacco. From Olweny's (1990) study among oriental societies, consumption of tobacco mixed with "betel quid" induced about 90% of oral cancer cases. In South Africa, drinking of spirit liquor among local people was attributed to high occurrence of colorectal and eosophageal cancers (Bradshaw et al. 1983).

Positive association of urinary cancer with the use of kerosene stove for domestic cooking can be linked to frequent exposure of low socio-economic residents to indoor air polluted by incomplete combustion of hydro-carbons (Rowland and Cooper, 1983). Ana et al. (2010) attributed the differentials in cancer occurrence between two Nigerian cities to population exposure to higher air pollutant in the city with more cases.

CONCLUSION

Cancer incidence and occurrence showed marked differentials both in magnitude and proportion within Ile-Ife city. While the relatively socio-economic developed areas of the city recorded higher burden of cancers, the occurrence of cancers linked with infections and poor hygiene were more predominant in the traditional and less modern areas of the city. The risk factors highlighted by this study included frequent use of alcohol, exposure to indoor polluted by incomplete combustion of hydrocarbon and poverty among the low socio-economic residents. Risk factors among the relative high socio-economic residents are "western" consumption lifestyle and possible exposure to pesticides.

It is therefore recommended that cancer intervention programmes at community levels should take cognizance of the variations in cancer profile and risk factors. Specifically, lifestyle of the residents that exposes them to infections and pollutants should be addressed. While the current intervention for early detection and control of gender specific cancers is desirable, the prevention of those that are infections related requires urgent attention.

As this study is based on clinic records, unreported cancer cases and reported case with incomplete information were excluded from the analysis. Moreover, a repeat of this study in the study area may show variable results due to dynamics in residential pattern and socio-demographic structure of the community. Finally, an inclusion of explanatory variables not captured in this study may reveal other salient factors of cancer pattern in the study area.

ACKNOWLEDGEMENTS

The grant provided by the Council for the Development of Economic and Social Research in Africa (CODESRIA) for conducting the doctoral fieldwork from which this paper is extracted is appreciated. I also thank Prof Folashade Iyun (now late) for the valuable academic contribution she made to this research. The permission for data collection and assistance of the University teaching hospital officials at Ile-Ife and Ibadan are highly appreciated.

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