PRESENTATION PATTERNS OF INVASIVE CANCER OF THE CERVIX:- A ZIMBABWEAN STUDY

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DECLARATION

I, Eucaria Yemukayi Mushosho declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed **Date**

ABSTRACT

The focus of this study is on the presentation patterns of invasive cancer of the cervix (CaCx) in Zimbabwe. The study was undertaken at a large referral cancer treatment centre in Harare the capital city of Zimbabwe. The main study question addressed was: Are there any changes in the presentation patterns of invasive CaCx in Zimbabwe? This was subdivided into three sub questions: 1) What are the presentation patterns of invasive CaCx among the Zimbabwean women presenting to the major referral centre in terms of histology, stage of the disease, ages of patients, Human immunodeficiency virus (HIV) status and socioeconomic status? 2) What is the trend in the presentation patterns of invasive CaCx in terms of the study variables during the period of study? 3) Are there any correlations that exist among the study variables?

This study was conducted because of the sharp contrast that exists in invasive CaCx presentation patterns and incidence between the developed and developing countries. The incidence is now very low in developed countries while it is continuing to rise in developing countries resulting in death among women at a time when they are supposed to be more effective in their families and the nation at large.

A retrospective documentary study of patients' files using an observation check list was done from 1998 to 2010. A systematic sample of four years was selected with 1998 as the base year (1998, 2002, 2006 and 2010). To strengthen the sample all the available patients' files for the selected years were considered.

On average the majority of the patients (91.75%) presented with squamous cell carcinoma (SCC), 5.5% presented with adenocarcinoma and 2.75% with other types of histology. It was found that (89%) of women presented with late stage disease (stage IIB and above). The ages of patients at presentation were between 40 to 60 years. Very few patients had recorded HIV status in 1998 and 2002 but a significant increase in proportion of patients with known HIV status was noted in 2006 (48%) and 2010 (73%). The average percentage for HIV positive patients for 2006 and 2010 was 57% and the average percentage for HIV negative patients was 43%. The majority (58.25%) of the patients were of low socio-economic status.

No significant change in trend was noted for variables except for HIV status where there was a downward trend in the percentage of HIV positive patients and an upward trend in the percentage of HIV negative patients. When correlation analysis was done among the variables no significant association was noted among the variables except that a low degree of association was recorded for the ages of patients and HIV status. The association

indicated that young invasive CaCx patients are associated with HIV infection at presentation.

The recommendations are that the government should mobilize resources towards prevention and control of invasive cancer of the cervix and awareness campaigns on early presentation should increase. Furthermore the cancer registry should expand its services to cover all health institutions nationwide.

It is also recommended that further studies should be done on the presentation patterns of invasive CaCx and of HIV status. Longitudinal studies are recommended in order to monitor changes in presentation patterns.

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DEDICATION

To my father in law Adonia Chiwurawa Mushosho who died during the time of the study.
You lived your life to the full.

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GLOSSARY

Terms/Acronyms/Abbreviations	Definition/Explanation
Adeno	Adenocarcinoma
AFHoz	Association of Health Funders of Zimbabwe
AIDS	Acquired immunodeficiency virus
ART	Antiretroviral therapy
CaCx	Cancer of the cervix
CIN	Cervical intraepithelial neoplasm
FIGO	International confederation of Gynaecology and Obstetrics
FIGO staging	Staging classification drawn up by the International Federation of Gynaecology and Obstetrics to define the extent of the spread of cancers of the ovary, uterus and cervix
Freq	Frequency
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
Pap smear	Papanicolau smear
PASS	Poverty Assessment Survey
SCC	Squamous Cell Carcinoma
TNM classification	A classification defined by the UICC for the extent of tumour spread of cancer
Tumour	An abnormal swelling in or on a part of the body
UICC	Union International Contre le cancer: An international body promoting cancer prevention and treatment
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation
ZMHCW	Zimbabwe Ministry of Health and Child Welfare

CHAPTER 1

BACKGROUND AND CONTEXT OF STUDY

Health research is the process where one obtains knowledge and technology that can be used for the health of individual groups, (Davies 1991) in Bowling (2009:3) while health system research is concerned with improving the health of a community by making sure that there is efficiency and effectiveness of the health system as an integrated part of the overall process of socio-economic development (Varkevisset et al., 1991 in Bowling, 2009:3).

1.1 Research focus

The focus of the study was to determine the presentation patterns of invasive cancer of the cervix (CaCx) in terms of histology of the disease, stage of the disease, age, Human immunodeficiency Virus (HIV) status of the patient and socio-economic status. The research design was a retrospective study where secondary data in the form of patients' files were observed for the study variables and statistical analysis was conducted in terms of trend analysis, Chi square tests and correlation analysis. The study included all the patients' data for selected years from 1998 to 2010 where systematic random sampling was used with 1998 as the base year. This resulted in the sample years being those years at four year intervals; 1998, 2002, 2006 and 2010.

1.1.1 Research question

The overall research question for this study was:

Are there any changes in the presentation patterns of invasive CaCx in Zimbabwe?

1.1.2 Research sub questions

The overall research question has three sub questions which are:

1. What are the presentation patterns of invasive CaCx among the Zimbabwean women presenting to the major cancer treatment referral centre in Zimbabwe in terms of histology, stage of the disease, age of patients, HIV status and socio-economic status?
2. What is the trend in the presentation patterns of invasive CaCx in terms of the study variables during the period of study?
3. Are there any correlations that exist among the study variables?

1.1.3 Main objective

To identify the presentation patterns of invasive CaCx in Zimbabwe.

1.1.4 Sub objectives

1. To identify the presentation patterns of invasive CaCx among Zimbabwean women presenting to the major cancer treatment referral centre in Zimbabwe in terms of histology, stage of the disease, ages of patients, HIV status and socio-economic status.
2. To analyse the presentation patterns of invasive CaCx for the period under study using trend analysis.
3. To explore any correlation that might exist between the following variables: histology of the disease, stage of the disease, ages of the patients, HIV status of the patients and their socio-economic status.

1.2 Site of study

The site of this study was the main cancer treatment referral centre that is part of a large teaching hospital in Harare, the capital city of Zimbabwe. This has been the only functioning cancer treatment centre in Zimbabwe from about 2000 to 2010 when the only other referral centre was refurbished. This meant that for the period of this study this major cancer treatment referral centre in Harare was the only cancer treatment facility to provide a service for the patients in Zimbabwe. The cancer treatment referral centre is at a central hospital and all the other hospitals including private health institutions refer invasive CaCx patients to this centre. This centre also treated many patients from neighbouring countries like Zambia and Mozambique during the period of interest. In order to meet the aims of the study all or any patients from any other country were excluded. The data set was delimited to the files of Zimbabwean patients at this major referral centre in Harare who presented with invasive CaCx during the sample years of (1998, 2002, 2006 and 2010).

1.3 Study variables

The dependent variables of the study are:

1.3.1 Histology of the Disease

The histology in CaCx describes the cell types composing the tumour. The World Health Organisation (WHO 2010) states that squamous cell carcinoma (SCC) constitutes about 90-95% of all CaCx cases in developing countries with adenocarcinoma constituting 2-5%. Adenosquamous carcinoma, adenoid cystic carcinoma and metastatic carcinoma constitute 3-5% of all cases.

1.3.2 Stage of the disease

The stage of disease is a measure of the extent of spread of the disease. The FIGO staging system is commonly used for staging of patients with CaCx (Appendix A) and is the staging system routinely used at the study site. It is based on clinical rather than surgical findings and was compiled by the International Federation of Gynaecology and Obstetrics. In some cases the TNM staging established by the American Joint Committee on Cancer (AJCC) is used. Both systems classify cancer on the basis of three factors: the extent of the tumour (T); whether the cancer has spread to the lymph nodes (N) and whether it has spread to distant sites (M) (AJCC, 2010:395-402). In cancer management the stage of the disease is a factor known to affect prognosis. A five year survival rate for stage I CaCx has been reported to be 90% while survival rates for stages II and III decrease to 50% and 10% respectively (WHO, 2010). A detailed stage by stage five year survival rate as stated by the American Cancer Society (2011:27) is in Appendix B. Bassett, Borok, Brenner et al. (2004:860-864) and Holleb, Fink and Murphy (1991) reveal that the five year survival rate for CaCx patients in Zimbabwe is low.

1.3.3 Ages of patients

The age of the patient was taken to be from the time of birth to the time of first presentation at the study site for patients with confirmed CaCx diagnosis.

The reason for considering age as a study variable was because of the observed variation of the age of CaCx patients at presentation with invasive CaCx at presentation. It has been reported that patients who are infected with HIV are now presenting at a younger age and at a more advanced stage of the disease as compared to those who are not HIV infected (Namagembe, 2007).

1.3.4 Human immunodeficiency virus status

The HIV status is an indication of whether the patient is HIV positive or negative at presentation. An association has been reported in a Kenyan study between HIV infection and Human Papilloma Virus (HPV) infection such that HIV patients are frequently infected by the HPV (Gichangi, Bwayo, Estambale et al., 2003: 1963-1968). The same authors also argued that there is a strong link between HPV and invasive CaCx. This suggests that there could be a link between HIV status and the prevalence of invasive CaCx. However there have been conflicting reports in a South African Study by Moodley, Hoffman, Carrara et al. (2006:6135) who did not show an increased incidence of HIV infection in women with invasive CaCx.

1.3.5 Socio-economic status

According to the Zimbabwe Ministry of Health and Child Welfare (ZMHCW) the social determinants of health in Zimbabwe are defined as food availability, security, housing, safe water and sanitation, hygiene and employment (ZMHCW, 2009:35). In this study the socio-economic status was established using two variables which are the employment status of the patient and their residential area. The two variables were selected because they encompass the social determinants of health as defined by the Ministry of Health and Child Welfare in Zimbabwe. The location of the residential area determines whether there is hygiene and safe water and sanitation as well as security. Employment status determines whether there is income to ensure food availability and housing. The classifications adopted for this study were as follows:

- High socio-economic status: employed and residing in the urban areas.
- Middle socio-economic status: not employed and residing in the urban areas or employed and residing in the rural areas.
- Low socio-economic status: not employed and residing in the rural areas

Any person in formal or informal employment or who had an income generating business was considered to be employed. Rural areas were defined as any peri-urban areas, areas occupied by peasant farmers or farms where peasant farmers were resettled during the land reform programme. Urban areas were considered to be cities or commercial farms and plots.

Human Papilloma virus is known to be relevant to CaCx. However it was not included as a study variable due to the fact that HPV screening is not routinely conducted at the study site. In participants where such screening was done the results were not at the study site and therefore were not accessible for this research.

1.4 Rationale

The ratio of CaCx patients in relation to the total number of patients registered per year in Zimbabwe showed an upward trend between the years 1990 to 2004 (Cancer Registry of Zimbabwe, 2010). The data from the study centre indicated that from year 2000 to 2010 the ratio of invasive CaCx patients registered to the total number of patients registered per year increased from 23% to 74%.The National Cancer Institute of Canada also reported similar upward trend of CaCx in developing countries including Zimbabwe after carrying out an international comparison of CaCx incidence. This is a cause of concern because other countries especially the developed countries like United Kingdom (UK) and United States of America (USA) have reported a marked reduction in the incidence of CaCx for the past three decades (Pecorelli, Favall, Odiano et al., 2003:369-379).

A survey done by Bassett et al. (2004:860-864) revealed that the five year survival rate for CaCx patients in Zimbabwe is very low compared to other surrounding countries indicating that the prognosis of women in Zimbabwe is very poor. Holleb, et al. (1991) reveals the same pattern when they reported that CaCx is the leading cause of death in relatively young women in developing countries such as Zimbabwe.

While many Zimbabwean women are dying with CaCx there are claims that this disease can be prevented (Saraiya, Ahmed, Krishnan et al., 2007:360-370). Saraiya and

colleagues argue that screening and HPV vaccinations in woman have lowered the incidence of invasive CaCx to negligible levels making it a preventable disease. Since studies in Zimbabwe have indicated that screening is not very effective in the country (Moyo, Koni, Makunike, et al., 1997:223-225; Ndlovu & Kambarami 2003:107-111), the researcher felt that a study on the presentation patterns of invasive CaCx could assist policy makers to improve the management and control of this disease.

1.4.1 Significance of the study

This study will reveal the presentation patterns and possible trends of CaCx in Zimbabwe. It will also contribute to guiding policy makers in the health system to make policies that support the needs of CaCx patients if they are informed about the disease patterns in this country. Currently cancer health workers and support groups are lobbying for financial support from the government and other well-wishers to improve CaCx awareness programmes. Findings from this study could be instrumental in emphasizing the importance of government and Non Governmental Organisation intervention. This study will also enlighten health professionals on the presentation patterns of CaCx in Zimbabwe and in turn they will be able to promote awareness of the disease patterns to the public and promote further campaigns towards the prevention and the early detection of the disease.

1.5 Research context

In this section the global, African and Zimbabwean contexts of cancer occurrence and specifically that of invasive CaCx are outlined and discussed.

1.5.1 Global context

Globally research has shown that in the year 2000, ten million new cases of cancer were recorded, there were six million deaths from cancer and twenty two million people were recorded to be living with cancer (Parkin, 2001:533-543). According to The American Cancer Society (2011), 12.710 million new cases of invasive CaCx will be diagnosed

and about 4.290 million women will die from invasive CaCx in 2011.However the same author reported that both the incidence rate of invasive CaCx and the mortality rates significantly decreased in the more developed countries during the last three decades. This is related to available options for disease prevention with the possibility of early diagnosis of the disease and the accessibility of effective treatment procedures. To this end it has been noted that women living in industrialised areas have a 208% greater chance of being successfully treated when compared with women in less developed countries (Montz, 1999:381-382).

Patients with stage I disease at diagnosis are claimed to have a 90% five year survival rate while survival rates for stages II and III decrease to 50% and 10% respectively (Perez, et al.1992). Regrettably patients with stage IV disease at presentation are reported to develop complications from haemorrhage, anaemia and from the radiation therapy (Bang, White, Gause, et al., 1988:1255-1261).

1.5.2 The African contexts

The knowledge and awareness of CaCx on the African continent is poor and mortality is very high while facilities for prevention and treatment of the disease are inadequate within the region (Anorlu, 2008). The same author urges that governments in sub-Saharan Africa need to recognise cancer as a major public health concern and allocate resources for treatment, prevention and research. Nkyerkyer (2000:534-537) furthermore perceives the absence of accurate population and health statistics as a major problem in sub-Saharan Africa, making it difficult to carry out studies on disease incidence in the region. All these problems are made worse by the lack of properly functional and maintained cancer registries in most African countries as reported by Okobia (2003:89-98).

Incidence of cervical cancer in Africa

Parkin, Ferlay, Hamdi-Cherif et al. (2003) reported that CaCx is the most common cancer in sub-Saharan Africa. This disease accounts for 22.2% of all cancers in women and is also the most common cause of cancer death among African women. The incidence rate of Invasive CaCx in Africa is 15 times higher than in developed countries (Parkin, *et al.,* 2003). In an earlier publication Parkin, Whelan, Ferlay et al. (2002)

reported that 60% to 75% of women in Africa who develop cancer live in the rural areas where mortality is very high. They went on to argue that this is due to lack of financial and geographical access to health care. Wabinga, Parkin, Wabwire-Mangen et al. (2000:1585-1592) indicated that the incidence of CaCx in Uganda, Mali and Zimbabwe appear to be on the rise.

Mortality of cervical cancer patients in Africa

Invasive CaCx mortality is reported to be very high in Africa as compared to developed countries (Sankaranarayanan & Ferlay, 2006:207-225).

The high mortality is due to poor medical facilities in the rural areas where most of the women who are diagnosed with CaCx reside (Anorlu, 2008). It has also been noted by the same author that poor nutrition and co-morbid conditions such as anaemia, HIV infection, stage of disease at presentation, poor quality care and lack of treatment due to poverty are other contributing factors to the high CaCx mortality in Africa. .

1.5.3 The Zimbabwean context

Zimbabwe with its history is one of those countries with clear evidence of linkage between the health status of a nation and its social, physical and economic environment (ZMHCW, 2009:30-96). Thus with this background the Zimbabwean context is discussed in terms of its socio-political, socio-economic and health context.

Socio-political context of Zimbabwe

The Zimbabwean population as at 2002 was estimated to be 11.38 million (O Index Mundi, nd). Keffani (2010) described the period of 1980 to 2006 as a period where a lot of changes occurred economically, socially and politically in Zimbabwe. The country gained its independence in 1980 and for the period 1980 to 1990 it was considered the bread and butter basket of the sub-Saharan region with a very sound economy (Potts, 2006). After gaining its independence the Zimbabwean government adopted a number of policies and among them was the policy of "equity in health". This policy entailed: resource redistribution towards health needs; a shift in the budget allocation towards preventive care; expansion of rural infrastructures; increased coverage of primary health care; introduction of free health services for those with an income below Z$150 a month and reorientation of medical training towards the needs of the majority (ZMHCW,

2009:30-96). The implementation of this policy by the ZMHCW was challenged by several trends and features of the health system such as shortage of drugs and the "brain drain" which became more pronounced due to the economic stagnation of the country.

Chitsiku, (2003) in ZMHCW, (2009:30-96) reported that in 2000 Zimbabwe embarked on the land reform programme which resulted in the rural and urban to farming area migration. However these farming areas had no social amenities to support a healthy living environment (ZMHCW 2009:30-96).

The socio-economic status of Zimbabwe

The ZMHCW (2009:30-96) reported that the economy of Zimbabwe had been experiencing a down turn for the past ten years which was attributed to the following factors: droughts and floods; absence of balance of payment support; withdrawal of lines of credit and disinvestment by foreign firms; shortages of foreign currency for importing raw materials; shortage of equipment as well as electricity and the devastating impact of HIV and AIDS epidemic to the workforce and communities. The Zimbabwe Monetary Policy Statement of 2006 reported that some of the challenges on the macroeconomic front included hyperinflation and low foreign exchange reserves (Gono, 2007). The Zimbabwe Poverty Assessment Study Survey (PASS) of 2003 also reported that urban area households were increasingly becoming poorer due to the deteriorating macroeconomic environment. Although the poverty incidence in urban areas was high the findings of the survey revealed that rural households have remained the worst off economically. In the midst of these negative changes it is further reported that 3.2 million people had left the country and amongst these people were also health workers who went to other countries in search of better working conditions (ZMHCW, 2009:30-96).

The health context in Zimbabwe

According to the ZMHCW (2009:30-96) the public health system of Zimbabwe consists of 4 levels which are: the primary; secondary; tertiary and central level. These levels are described as follows:

The primary level: this level consists of a network of health centres and village health workers. The local health centres liaise with the village health workers who are the key link between the organised village and the local health centres. The role of the village health worker is to promote, educate and mobilize the community and individuals on preventive health activities. Supervision of the village health workers is done by the rural health centres which keep the village health workers supplied with medicines and equipment at government expense. Village health workers encourage communities to seek treatment early from rural health centres or clinics.

The secondary level: this level is where rural health centres refer patients to district hospitals. Each district should have a district hospital which should serve a population of 140 000 people.

These district hospitals provide referral and supervisory support to the network of clinics and rural health centres in the district. They provide preventive and curative services. This is where patients have their first contact with a medical doctor.

The tertiary level: Most provinces have provincial hospitals which are at the tertiary level and which provide referral support to district hospitals. There are a limited number of specialists at a provincial hospital.

The central level: Central level hospitals offer referral support to provincial hospitals. These hospitals are located in only three cities which are: Harare, Bulawayo and Chitungwiza. Cancer treatment referral centres are located in two of these central hospitals one which is in Bulawayo and the second and bigger one in Harare.

While the public health system has such a clearly defined structure, the major problem it has is the dissemination of information from the top (central level) down to the village health worker (the primary level) and vice versa.

Based on the data from Zimbabwe Demographic Health Survey Report 2005-2006 (2009) it was noted that Zimbabweans are dying from easily preventable and treatable diseases. The health status of Zimbabwe is summarised as consisting of a high prevalence of HIV and tuberculosis, high child and maternal mortality rates, cholera epidemics, high risks of contracting malaria and continued increase in non-

communicable diseases such as diabetes, hypertension and cancer (ZMHCW, 2009:30-96).

Invasive cancer of the cervix in Zimbabwe

Parkin, Vizcaino, Skinner et al. (1994:540) looked at cancer patterns and risk factors in the African population of South Western Zimbabwe for the period 1963 to 1977 and revealed that the dominant malignant tumour among Zimbabwean women was cancer of the cervix. Figures from the Cancer registry in Zimbabwe from 1990 to 2004 also showed that cancer of the cervix was the most dominant cancer of females in Zimbabwe (Cancer Registry of Zimbabwe, 2010).

In terms of histological type, Parkin et al. (1994:540) reported that 86% of the cancers of the cervix were Squamous Cell Carcinoma (SCC) and 3.4 % were adenocarcinoma. In this report Parkin et al. (1994:540) further claim that the risk of developing cervical cancer increased more in illiterate women relative to those who were literate.

Availability and Accessibility of Cervical screening in Zimbabwe

A Zimbabwean study by Ndlovu and Kambarami (2003:107-111) identified that there is late presentation for treatment in most invasive CaCx patients, the reason being that there is poor CaCx screening with a high percentage of false negative results. Moyo, et al. (1997:223-225) previously contributed information pertaining to the neglect of screening where they concluded that four city council clinics they had studied in Harare, Zimbabwe had 50% of their Pap smears as being sub optimal. The sub optimal Pap smears resulted in some tests being false negative or false positive. In their recommendations they advocated for the development of comprehensive policies on cervical cancer screening and the formal training of health workers that do Pap smears. They also called for the allocation of adequate resources towards cervical cancer screening Moyo et al., 1997:223-225).

1.6 Overview of thesis

A brief outline of the chapters in this thesis is as follows:

1.6.1 Chapter 2: Literature review: Invasive cancer of the cervix

This chapter is divided into two major sections starting with the first section (see 2.2) which covers the general principles of invasive CaCx. The second section (see 2.3) focuses on the presentation patterns of invasive CaCx with more emphasis being given to the variables relevant to the study which are histology of the disease, age of patient at presentation, stage of the disease, HIV status and socio-economic status of the patient.

1.6.2 Chapter 3: Methodology of the study

The research strategy clearly outlines how data was gathered and analysed. Systematic sampling of the years of study is described where the base year was selected as 1998 and every other fourth year was selected as the sample for the period 1998 to 2010. The trend analysis, Chi square tests showing goodness of fit and correlation analysis are described as the tests to be done to show the different presentation patterns of invasive CaCx. Reliability and validity of the study are explained and the ethical considerations are described.

1.6.3 Chapter 4: Data presentation, results and analysis of the study

Results are stated graphically using pie charts, histograms and line graphs to show the trends in presentation patterns. Results from the Chi square tests and correlation analysis are presented.

1.6.4 Chapter 5: Discussion of study findings, conclusions and recommendations

The findings from the results are discussed and compared with other findings from selected previous researches. Research contexts which could have influenced the results are discussed. The conclusions of the study are presented and recommendations on what may be done to improve the prevailing conditions are given in this section. Challenges and limitations occurring during the study are discussed.

CHAPTER 2

LITERATURE REVIEW: INVASIVE CANCER OF THE CERVIX

A good literature review is a critical, factual overview of what has gone before (Hofstee, 2006).

2.1 Introduction

The focus of this study is on the presentation patterns of CaCx in Zimbabwe in order to align the management of invasive CaCx with the possible changes in its presentation patterns for the period 1998 to 2010.

The chapter starts with the general overview of literature on invasive CaCx covering the following: incidence; aetiology; prevention and early diagnosis; pathological classification; staging; treatment and prognosis. This is followed by the review of literature on the presentation patterns of the disease in terms of histology, stage, age of patients, HIV status and socio-economic status of patients at presentation.

2.2 General overview of invasive cancer of the cervix

The overview of invasive CaCx in terms of the factors mentioned in section 2.1 (incidence, aetiology, prevention and early diagnosis, pathological classification, staging, treatment and prognosis) is an important background to the presentation patterns of invasive CaCx in the context of this study because certain of these factors may contribute towards changes in presentation patterns.

2.2.1 Incidence

Cancer of the cervix is the second most common cancer among women worldwide with a high incidence in Sub-Saharan Africa (Parkin, et al., 2003; Garcia, Omid & Anthony, 2007). In developing countries such as Zimbabwe invasive CaCx is the most common cancer in females and also the leading cause of cancer related deaths in women (Chokunonga, Borok, Ramanakumar, 2004).

This is in sharp contrast to developed countries like U.S.A where invasive CaCx is becoming very uncommon due to increase in vaccination and effective screening (America Cancer Society, 2011; Bardaro, 1996). The American Cancer Society (2009) has reported that the cervical cancer death rate in U.S.A. has declined by 70% between the years 1955 to 1992. However the incidence of cervical cancer in Zimbabwe and in many other developing countries continues to rise due to lack of vaccination and effective screening (Giardi, Litchtttenegger, Tamussion, et al., 1989:206-211).

Age of incidence

Invasive cervical cancer tends to occur in the midlife. Most cases are found in women younger than 50 years (American Cancer Society, 2011). It rarely develops in women less than 20 years old. Some 20% of the women are diagnosed with invasive CaCx when they are 65 years old (American Cancer Society, 2011). It is noted that women in sub-Saharan Africa lose more years to cervical cancer than to any other type of cancer; the disease unfortunately affects them at a time of life when they are critical to the social and economic stability of their families (Parkin et al., 2003). Mqoqi, Kelet, Sitas et al. (2004) have reported that cancer of the cervix is the most common cancer in South Africa with the highest incidence among women of the age group 30 to 54 years.

2.2.2 Aetiology

Reimers, Anderson, Rosenberg et al. (2009) published the following as causes of cervical cancer: sexual activity below the age of 20 years, multiple sexual partners, exposure to sexually transmitted diseases; mother or sister with cervical cancer; smoking; immunosuppression caused by HIV/ AIDS and HPV. Parkin (2006) also pointed out that HPV infection with high risk strain types is known to be a common cause of developing cervical cancer. Among the causes noted by Reimers et al. (2009) sexual activity below the age of 20 years and multiple sexual partners expose women to a high risk of acquiring HPV infection. The reason for this is because HPV virus is sexually transmitted and affects roughly 80% of sexually active people whether they have symptoms or not (Marrazzo, Koutsky, Kiviat, et al., 2001:947-952). Some socio-cultural factors in Sub-Saharan Africa also expose African women to HPV infection (Schmauz, Okong, de Villiers, et al., 1989: 805-809).

Such factors are early marriages, polygamous marriages and high parity. In some of these cultures very young girls, usually virgins, are given out to marriage to much older men some with three or more wives.
This may increase the likelihood of a girl catching HPV infection at first intercourse with her husband. Polygamy is reported to increase the risk of cervical cancer two-fold and the risk increases with the increasing number of wives (Bayo, Bosch, de Sanjose, et al., 2002:202-209). High parity, which is the norm in some cultures in Africa, is also a recognised, independent, HPV-related co-factor for the development of cervical cancer (Brinton, Reeves, Brenes, et al., 1989:486-496; Hildesheim, Herrero, Castle, et al., 2001:1219-1226; Bayo, et al., 2002:202-209; Munoz, Franceschi, Bosetti et al., 2002:1093-1101).

More than 150 types of HPV are known to exist and of these fifteen (15) are classified as high risk types (16; 18; 31; 33; 35; 39; 45; 51;52;56; 58;59; 68; 73 and 82) (Gottlieb & Nicole 2002:04-24; Martin-Hirsch, Koliopoulos, Abyn et al., 2007:104;232-247). Types 16 and 18 are acknowledged to cause about 70% of cervical cancer cases (Munoz, Bosch, & de Sanjose, 2003:518-527). The American Society (2009) has endorsed that for a patient to develop CaCx they must have been infected by HPV and hence invasive CaCx is viewed as a sexually transmitted disease. However it is further argued that it is the causative agent (HPV) that is sexually transmitted and not the cancer (Snijders, Steenbergen, Heideman et al., 2006:152-164).

Besides HPV infection, individuals which are HIV infected are also at a substantially increased risk of developing a number of neoplasms. Three (3) malignant conditions are now considered as defining AIDS when they occur in HIV infected individuals. These conditions are Karpos's sarcoma, certain aggressive Non Hodgikin's lymphomas and invasive CaCx (Franceschi, Dal Maso, Ariani et al., 1998). In 1993 cancer of the cervix was declared as an AIDS defining condition because of its association with HIV/AIDS by the Centre for Disease Control (CDC), (1993:1-19). Thomas, Ray, Kuypers et al., (200IA:740-748) in their studies demonstrated an association between HIV and the increased prevalence of human papilloma virus and cervical cancer. Schoeman, Van Wyngaardt, Horn et al. (2006:17) showed that there is a slight association between HIV and CaCx. This was contradicted in a study by Newton, Beral, and Weiss (1999:237-262; 272) which showed that there is no association between HIV and cervical cancer.

Early literature from 1980's to 1990's showed that there was conflicting data regarding the excess of frequency of cervical cancer in HIV infected women (Denenberg, 1997). This lead Clarke and Chetty, (2002) to conclude that the relationship between HIV and invasive CaCx is controversial.

2.2.3 Prevention and early detection

Cervical cancer is a preventable and curable disease, which can be prevented by vaccinations and screening and is curable if identified at an early stage (Parkin et al. 2003). In developed countries HPV vaccines are used as a way of preventing invasive CaCx. The commonly used vaccines are Gardasil, which is a vaccine against HPV 6, 11, 16 and 18.This vaccine has been shown to be up to 98% effective. Crevarix is another vaccine which is 92% effective in preventing strains 16 and 18 and has been effective for more than four years (MediLexicon International Ltd, 2006). The HPV vaccines are targeted at girls and women of ages 9 to 26 years because vaccines only work if given before the infection and these vaccines have proved to be effective for at least 4 to 6 years, (Harper, Gall, Naud et al., 2008:158-159). The high cost of the vaccinations has been the cause of concern and most of the countries in Sub-Saharan Africa are unable to fund such programmes.

The use of condoms also helps in preventing invasive CaCx. The exposure of the cervix to semen appears to increase the risk of precancerous changes and the use of condoms regress the process (Hogewoning, Bleeker, van den Brule et al., 2003:811-816). Higher levels of vegetable consumption are associated with a 54% decrease in HPV persistence and Vitamin A, C and E are also said to be effective in preventing CaCx (Giuliano, Siegel, Roe, et al, 2003:1508–1516).

Pap smear for cervical cancer screening has dramatically reduced the incidence and mortality of invasive CaCx in developed countries (Canavan & Doshi, 2000:1367-76). Screening using the Pap smear every 3 to 5 years with appropriate follow up can reduce cervical cancer incidence by up to 80% (Saraiya, Bekowitz, Wideroff et al., 2010). An abnormal Pap smear result may suggest the presence of cervical intraepithelial neoplasm before the cancer has developed thus allowing examination and preventive treatment.

Liquid cytology was also incorporated within the UK national screening programme. This initially was meant to improve on accuracy of the Pap test but its main advantage has been to reduce the number of inadequate smears from 9% to 1% (Megevand, Denny, Dehaeck, et al., 1996).Visual Inspection with 4% acetic acid in the presence of good training and quality assurance has also proved to be effective in screening for cancer cells in India (Sankaranarayanan, Esmy, Rajkumar et al., 2007:398-406).

The HPV test for cervical cancer triage which detects the presence of HPV in the cervix has proved to be more sensitive than Pap smear. Due to its sensitivity most researchers recommend that HPV testing should be done together with the routine screening. Given the prevalence of HPV others suggest that this would cause undue alarm to carriers resulting in more unnecessary follow up testing and treatment (Walboomers, Jacobs, Manos et al., 1999:9-12)

2.2.4 Pathologic classification

Invasive CaCx pathology can be classified into a number of histological subtypes some of which include; squamous cell carcinoma (SCC) which constitutes 80-90%, adenocarcinoma 15% and neuroendocrine carcinoma (Garcia, et al., 2007; Dolinsky, 2006). Of all the histology types, SCC is the cervical cancer with the highest incidence. The incidence for adenocarcinoma is not very significant as compared to the SCC although it has been on the increase in recent years (Kumar, Vinay, & Abbas, 2007:718-721).

There is great variation of growth pattern and cell type as well as degree of differentiation. In SCC the malignant cells may be subdivided into keratinizing and non-keratinizing types (WHO 2010). The same source indicated that these tumours may be well differentiated, moderately differentiated or poorly differentiated. Approximately 50-60% is moderately differentiated and the remainder are evenly distributed between moderately and poorly differentiated. Other types of SCC include condylomatous squamous cell carcinoma, papillary squamous cell carcinoma and squamous transitional cell carcinoma (Reagan & Wentz, 1967:883-921).

2.2.5 Staging

Cervical cancer is categorized from Stage 0 through to IV. At Stage 0 the cancer cells are limited to the cells on the surface of the cervix and are termed pre-invasive cancer. At the most advanced stage the cancer will have spread beyond the pelvis and involve the bladder, rectum or distant organs (Bomford & Kunkler, 2003:403-405). CaCx staging is based on clinical examination rather than surgical findings. The staging recommended by the WHO is the staging done by the International Federation of Gynaecology and Obstetrics (FIGO) which is illustrated in appendix A.

2.2.6 Treatment of invasive cancer of the cervix

Very early stages of invasive CaCx (stage IA and below) are usually treated by hysterectomy and where the patient desires to remain fertile loop electrical excision procedure and conisation can be used. Other early stages IB and IIA can be treated with radical hysterectomy including lymph nodes removal or radiation therapy. In some cases where there are locally extensive tumours chemo-radiation is used. Advanced tumours of stage IIB to IVA are treated with radiation therapy and cisplatin based chemotherapy (Erstad, 2007:01-12). Patients with metastases are given palliative radiotherapy which is known to relieve pain, other symptoms caused by metastases in bone, brain, lymph node or other sites. A rapid course of pelvic radiotherapy can also provide excellent relief of pain and bleeding for patients who present with incurable disseminated disease (Perez, Brady, Halperin et al., 2004).

2.2.7 Prognosis of cancer of the cervix.

Prognosis of CaCx depends on the stage of the disease. The 5-year survival rate with treatment for the earliest stage of invasive CaCx is 92% and the overall 5-year survival rate (all stages combined) is about 72%. Prognosis drops dramatically with metastatic spread of the disease (American Cancer Society, 2009). Besides stage of the disease there are other factors that are known to affect prognosis which are, patient age and race or socio-economic status (Perez et al., 2004). Perez and colleagues reported on studies that showed that invasive CaCx has the same prognosis in women younger than 40 years and in older patients.

In contrast to this Delaloye, Coucke, Pampallona, et al. (1996:201-201) reported on European studies which showed better prognosis in middle aged women of 46- 60 years. For socio-economic status or racial differences a study reported by Mishra, Laskar, Muckaden et al. (2005:208-212) showed that African American women with invasive CaCx had a poorer 8-year cause specific survival rate (47.9%) compared to white patients with an 8-year cause specific survival rate of 60.6%.

2.3 Presentation patterns of invasive cancer of the cervix

A number of variables are linked to the presentation patterns of invasive CaCx but in this chapter the reviewed literature was centred on the variables of the study which are histology of the disease, stage of the disease, age of the patient at presentation, HIV status and the socio- economic status of the patient.

2.3.1 Histology of invasive cancer of the cervix

Globally the majority of cases of CaCx are SCC but the proportion of adenocarcinoma is higher in areas with low incidence of cervical cancer (WHO, 2010).

In developing countries 90-95% of all invasive cervical cancers are SCC and adenocarcinomas constitute less than 5% (WHO, 2010). A Zimbabwean study on cancer patterns and risk factors done over the period 1963-1977 revealed that of the one thousand two hundred and sixty three (1 263) cases of invasive carcinoma of the cervix registered 86% of those with registered histology had SCC and only 3.4% had adenocarcinoma (Parkin et al., 1994:537-547). Another study was done in Harare Zimbabwe in 1998 and it was reported that SCC constituted 91.8% of the invasive CaCx cases studied and adenocarcinoma constituted 7.7% (Chirenje, Rusakaniko, Akino et al., 2000:264-7).

A study done in Ilorin, Nigeria on Cancer of the cervix revealed the following pattern in terms of the histological types of invasive CaCx, the majority of the cases 85.2% were SCC variety, adenocarcinoma accounted for 5.4% and adenosquamous carcinoma accounted for 9.4%.

Of these histological types 36.6% were well differentiated and these were followed closely by the moderately differentiated type which constituted 33.6% and lastly the poorly differentiated constituted 30.9% (Ijaiya, Aboyeji & Buhari, 2004:319-322). Seth, Kaur, Verma, et al. (1988) reported on a study done in India on the relationship between the presentation patterns of CaCx with the histological type of the disease which revealed that there was no significant correlation between histology type and grades of tumour.

The percentage of adenosquamous carcinoma reported in the study in Ilorin was higher than the previously published 2.1% and the cause for this was unknown (Govan, Hart & Callander 1993: 216-224; Haghdel, Ardakany & Zeighami, 1999:265-271; Pindiga, El-Nafaty & Ekanem, 1999:52-56). However findings of the study done in Ilorin Nigeria were also comparable to the studies done in Iran and Maiduguri where SCC constituted 88% and 92% respectively (Haghdel et al., 1999:265-271).

Squamous cell carcinoma

Cannistra and Nillof (1996:1030-1038) and Kristensen, Holm, Abeler et al. (1996:433-438) indicated that invasive SCC is the most common malignancy of the female reproductive system. The incidence of this type of disease histology has been decreasing over the past several decades among blacks and whites in the USA presumably due to vaccinations and effective cervical screening. Effective cervical screening has been instrumental to detecting the disease in a precancerous state which can be treated before it turns into invasive CaCx (Piver, 1990:359-363; Kristensen, et al., 1996:433-438). However SCC incidence has been reported to be higher in the older age group and also relatively higher in white females, (Larsen, 1994:6-7). The same author indicated that a higher rate of incidence of SCC is associated with early marriage, and age at first intercourse is considered as the most important factor. It has also been reported that there is a direct relationship between SCC and the socio-economic status of an individual where the incidence of SCC is higher in people of low socio-economic status. Practically it has been reported that SCC is non-existent in nuns who are not sexually active. There are also reports that SCC is low in Jewish women and some researchers have linked this to the Jewish cultural behaviour of circumcision and where Jewish women are not involved in sexual intercourse during menstrual flow (Devesa, 1984:605-612; La Vecchia, Franceschi, Fasoli et al., 1986:935-941).

Adenocarcinoma

Garcia et al. (2007) reported that adenocarnomas constitute 15 % of all invasive CaCx. WHO, (2010) had a contrasting report which stated that adenocarcinomas constituted less than 5% of all cancers in developing countries. Garcia and colleagues also noted that adenocarcinoma of the cervix is most common in women over 45 years but can occur over a wide age range even including females during the teenage years. The causative factor for this could not be clearly concluded but it is thought to be caused by HPV.

The incidence of adenocarcinoma of the cervix is increasing but the absolute number of cases remains relatively small. Studies in Canada, Scandinavia and UK showed that the routine Pap smear screening has not only reduced the incidence of SCC of the cervix but in the last 10 to 15 decades judged from 1998 it has halved the mortality rate (Nieminen Kallio & Hakama, 1995; 1020-1021; Patrick, 1997:876-878). In comparison the incidence of adenocarcinoma has at best stabilised or at worst increased by 15% in the last 23 years (Van Wijangaarden, Duncan & Hussan, 1995:137-142). It has appeared that even well organised screening has failed to protect women from adenocarcinoma of the cervix (Mitchell, Medley, Gordon et al., 1995:894-897). Data from United States have clearly shown that invasive adenocarcinoma of the cervix has been increasing in both whites and blacks since the mid 1920's. This increase was only significant among whites reaching 4.2% per year for those born since 1935 (Zheng, Holford, Ma et al., 1996:252-258). A study done in China in 1993 showed that the percentage of adenocarcinoma increased with 1.7 % between 1959 and 1968, 5.08% between 1979 and 1988 and 5.08% again between 1989 and 1998.

An increase in the incidence of adenocarcinoma has also been reported in younger women. This is in contrast to the presentation pattern of SCC which is most common in older patients. This increase in incidence of adenocarcinoma was said to be linked to the use of oral contraceptives (Schwartz & Weiss, 1986:1045-1047; Goodman, Biettlar, Niloff, et al. 1989:241-247; Ursin, Peters, Henderson, et al. 1994:1390-1394). Two major studies were done in the USA and the first reported a doubling of risk for new users of contraceptives and quadrupling of risk for those women who had more than 12 years exposure (Ursin et al., 1994:1390-1394).

The same observation with duration of use of contraceptives has also been observed in a recent WHO collaborative study (Thomas & Ray, 1996:181-189) which also noted risk to be highest in recent and current users. Decline was also noted since cessation of use of the contraceptives. These trends were observed to be strongest in women under the age of 35 years.

2.3.2 Stage of disease at presentation.

The clinical staging of cervical cancer is important in the management of CaCx patients since it determines the patient's treatment protocol. Cancers detected at Stage 0 and not stage IA (the pre-invasive stage) require only local ablation of the cancerous epithelium, either by diathermy or laser. Stage I cancers are usually treated by radical hysterectomy with or without preservation of the ovaries according to the patients' age. More advanced cancers may require radiotherapy and/or chemotherapy. The clinical stage at time of diagnosis also affects the prognosis of the patient (Bomford & Kunkler, 2003: 414-415). If cervical cancer is detected at the precancerous stage then this disease could be considered the most curable form of cancer. It then follows that most countries where cervical cancer is an important cause of morbidity and mortality should include measures to promote early detection of this disease (Free, Roberts, Bourne et al., 1991:129-136)

In Pakistan, during the period December 1994 to June 2004, late stage at presentation for CaCx patients was reported in a Muslim dominated population. The following percentages of CaCx patients at presentation were recorded:

- 0.5% of the patients studied were stage 0;
- 11.7% were stage I;
- 33.4 % were stage II;
- 21.5% were stage III and
- 20.5% were stage IV.

These statistics indicate that a large proportion of patients presented late and only approximately 12% of the patients presented at stage I and below, (Badar, Anwar, Meerza, et al., 2007:24-26).

A number of studies done in India (Nandakumar, Anantha, Venugopal et al., 1995:1348-1352; Kaku, Mathew, & Rajan, 2008:598-594) revealed that late presentation was also a burden in the Indian population.

In South India a strong relationship was noticed where women of a low socio- economic status had a high risk of presenting with CaCx at an advanced stage (Kaku et al., 2008:598-594).

In 1993 the Malaysian state of Sarawak with a population of two million inhabitants had 70% of the CaCx patients presenting at an advanced stage (stage III and IV). Due to this late presentation the State Health Department had to set up a cost effective programme aimed at achieving down staging for CaCx. The programme consisted of training of health staff in rural areas to improve their skills in early cancer surveillance. It is claimed that after the programme the percentage of CaCx patients presenting with late stages dropped from 70% in 1993 to 27% in 1998 (Devi, Tangi & Corbex, 2007:1172-1176). Ponten (1994:388) in considering Devi and colleagues' findings concluded that the risk of late presentation is not just reduced by introducing screening programmes but education, awareness of the importance of early detection and professional specialization can improve the extend of late presentation in CaCx patients.

Stage at presentation in Sub-Saharan Africa

Late presentation is a feature of CaCx in developing countries (Parkin, Pisani & Ferlay, 1999:827-841). The stage at presentation of tumours in the African continent is generally very advanced. Cancer of the cervix is one type of cancers in Sub-Saharan Africa where late stage at presentation has been recorded in most countries (Schonland & Bradshaw, 1969:61-71; Rogo, Omany, Onyongo et al., 1990:249-255; Lomalisa, Smith & Guidozzi, 2000:460-463). The proportion of women with early stage disease (IA -IIA) has been as low as 13.3% in Zaria Nigeria, 19% in Zimbabwe and 34.5% in South Africa, (Emembolu & Ekwempu, 1988:265-269; Kasule, Coulson & Akino, 1989:61-64; Jennings, Soeters, Tiltman, et al. 2008:262). These low percentages are in contrast to what is happening in developed countries where the majority of patients present with early stage disease, (Nkyerkyer, 2000:234-237).

During the period 1997 to 2006 a study was done in Nigeria on presentation patterns of cancer of the cervix and the findings of the study were then compared with a similar study done ten years before.

Results showed a statistically significant change of stage at presentation where more patients were presenting with late stage disease as compared to the previous ten year study (Olusegan, Onwudiegwu, Oganniyi et al., 2008:1203-1204). The researchers attributed this change to lack of capacity and means to manage cancer effectively.

In another study late presentation was also defined as a problem in Nigeria. The study was done during the period 2005 to 2007 at Ibadan where 82% of the patients with known stages presented with stages III and IV and 18 % presented with stage IIB. None of the patients presented with stage I disease (Abdus-Salam, Ogunnorim & Abdus-Salam, 2008:141-143).

In Ghana, CaCx patients at a teaching hospital in Accra were studied and the following results were obtained: 30.2% of the patients presented with stage IB; 5.5% presented with stage IIA and 64 % presented with stage IIB or worse. This indicated that only 35.7 % of the affected women presented with stages of CaCx that could be treated in Ghana using radical surgery. On further analysis the researchers discovered that there was a relationship between stage of disease and age of patient (Nkyerkyer, 2000:534-538). This same relationship between stage at presentation and age of patient was also recorded in data from South Wales Central cancer registry where young age at presentation was associated with early stage at presentation (McCredje, Coates & Ford 1989:335-339).

Two studies, with one done at Ilorin, Nigeria and the other done in Kumasi Ghana reported same experiences of late presentation. The study done at Ilorin Nigeria during the period January 1990 to December 1999 reported that 75% of the patients had advanced disease due to late presentation with stage III being the most common stage at presentation. In Kumasi Ghana the same findings were also noted (Adadevoh 1994:333-334; et al., 2004:319-322).

Tanzania also has the problem of late presentation of CaCx patients. A hospital cross sectional study done at Mulimbili National Hospital, Dar es Salaam revealed that more than 90% of CaCx patients presented with stages III – IV disease during the period of study. The reason for the late presentation was concluded to be due to low levels of knowledge of the symptoms of CaCx (Kidanto, Kilewo & Moshiro, 2002:467-475). Moodley (2004:1991-1996) reported that in South Africa late presentation and lack of screening have resulted in the rise of cervical cancer mortality.

In Zimbabwe a study done at Parirenyatwa and Harare Hospitals located in the capital city, during 1998 showed that 80.3% of the patients presented with stages IIB and above. The researchers proposed that planned introduction of cancer screening programmes together with health education campaigns may result in a shift towards more women presenting early with curable cervical cancer cases (Chirenje, et al., 2000:264-267). The researchers' proposed solution of health education campaign was similar to the strategy adopted in the state of Sarwark Malaysia where the percentage of late presentation of CaCx patients dropped from 70% to 27% in 1998 (Devi et al., 2007:1172-1176). Another study was done in Harare Zimbabwe at Government referral hospitals during the years 2001 to 2002 where 80% of the CaCx patients presented with late stage disease. The high percentage of patients presenting with late stage disease was associated with the absence of a screening history (Ndlovu & Kambarami, 2003:107-111).

Proposed strategies to achieve down staging for cancer of the cervix

Devi et al. (2007:1172-1176) proposed that besides cervical cytology, public education, awareness of the importance of early detection and professional specialization can lead to down staging of CaCx at presentation. Free et al. (1991:129-136) believes that cervical cancer screening promotes early detection of the disease. However screening without proper awareness campaigns may not be as effective as if both strategies are adopted. This is the reason why in some countries there is a discrepancy such that after introducing CaCx screening there is reduction in late presentation for the young but for the old and poor in the rural areas not much change is noticed (Free et al., 1991).

In most African countries researchers have recommended that governments should mobilize enough resources for quality screening programmes in order to achieve a drop in the number of CaCx patients presenting late (Schonland et al., 1969; Chirenje et al., 2000; Kidanto et al., 2002; Abdus-Salam et al., 2008; Olusegun et al., 2008).

2.3.3 Age at presentation

The risk of CaCx increases until around the age of menopause and reaches a plateau or declines thereafter. This underlying age pattern may be due to the natural history of HPV infection and its accompanying carcinogenic mechanisms (Walboomers, et al., 1999:12–19). There is evidence as stated by Clarke and Chetty (2002:19-24) that the presence of HIV infection in CaCx patients has resulted in the presentation pattern of CaCx evolving at presentation at younger ages as compared to previous years. There is also an argument in several European countries that while CaCx incidence is declining in many European populations upward trends have been reported in younger women (Clarke & Chetty, 2002:19-24)

A study done in 13 European countries revealed the following patterns in terms of age at presentation:
For Denmark, Netherlands, Norway, Dlovenia and Sweden onset of CaCx was at the age of 25 years then there was a rapid increase between ages 30 and 40 years and a peak was reached at ages 44 to 49 years. After the peak, decline in subsequent age groups was fairly rapid (, Ponten, Bergstrom et al., 1997:159-165). In Finland onset of CaCx was at the age of 25 years and had a slower increase to a peak at 53years and a decline similar to Demark and other countries in its group (Bray, Loos, Mc Carron et al., 2005:677).

Trend analysis carried out in other countries showed that there is a significant decline in CaCx incidence in the American population except for the Hispanic women, Australia, the non-Maori women in New Zealand and in North and Western Europe. The trend towards a decline was noticed in the age range of 25 to 74 years. An increasing trend was noticed in young women for Slovenia, Jewish women born in Israel and the United Kingdom.

The predominant pattern shown by the cancer registries studied during the period 1973 -1991 showed a reduction in incidence of CaCx in developed countries due to wide spread screening for cervical cancer (Vizcaino, et al., 2000:429-435).

Data from New South Wales Central Cancer Registry comprising of all new cases of CaCx and deaths from CaCx registered in patients aged 15 years and above for the period 1973 to 1982 were examined using regression analysis.
The reason was to determine whether incidence or mortality was changing in New South Wales. From the analysis no significant trend was noticed in relation to age at diagnosis, stage at diagnosis or histological type. Generally younger age at presentation was associated with an earlier stage at presentation. There was no evidence of an increase in trend of young women presenting with more severe disease (Mc Credje, Coates & Ford, 1989:335-339).

A study done in Lahore Pakistan during 1998 to 2000 showed that 80% of the CaCx patients were above the age of 40 years. These results were similar to the findings of Roohi and Sachi, (1993:162-165). However Parveen, Akhtor and Shahid, (1995:95-98) and Shamsiddin, Chowdhury, Azim, et al. (1995:100-114) reported different findings where there were more cases of invasive CaCx in younger women as compared to those above the age of 40 years.

In Eastern England during 1960 to 1975 a study to assess the changes in presentation patterns of carcinoma of the uterine cervix were done and it was discovered that registrations of stage I and II lesions were in the 35-49 year age group. In 1970 the registration of all stages in all age groups declined. During the same period there was an increased proportion of the 50 -64 years age group registering with stage I and II lesions. Little change was noticed in the over 65 year age group. These changes in pattern of presentation were all attributed to the introduction of cervical cytology screening programme (de Bono, Pillerrs & Kirk, 1978:887-892).

Lamont, Symonds, Brodie, et al. (1993:351-357) carried out a study in the West of Scotland which showed that older patients presented with later stage disease as compared to those in the younger age group. Eighty percent of CaCx patients aged less than 35 years were stage I and II as compared with 32 % in the women aged 75 years.

In this study the authors concluded that there was no relationship between age at diagnosis and either histology or tumour grade.

Age patterns in Sub-Saharan Africa

In most countries in Sub-Saharan Africa invasive CaCx is most common in women in their fifth decade (Ijaiya et al., 2004:319-322).

A study done on the incidence of cervical cancer in Gambia demonstrated a rapid increase of cervical cancer in young ages and a peak in the 40-44years age group (Sighoko, Bah, Haukka, et al., 2010:2248-2256). Findings in Gambia were comparable to the results of a study done in Ilorin, Nigeria where the peak incidence of CaCx was in the fifth decade. This was also similar to findings in Maiduguri, Nigeria (Pindiga, et al., 1999:52-56; Ijaiya et al., 2004:319-322). In Ghana the mean age for cervical cancer was 52 years which is higher than the mean age of the studies done in Nigeria and other African countries (Nkyerkyer, 2000:234-237). The reason for this was associated to the fact that Ghanaian women start sexual activities at later ages as compared to women from other parts of Africa (Agyei & Hill, 1997).

2.3.4 Human immunodeficiency virus status

It is assumed according to Wright, Ellerbrock, Chiasson et al. (1994) that HIV positive woman are at a higher risk of developing high grade cervical intraepithelial neoplasm (CIN) which is precancerous and also associated with the HPV viral infection. The increase in incidence of CaCx in Uganda in the 1990s as compared to the 1960's was also assumed to be due to HIV prevalence in Uganda. However no study was done to substantiate this assumption (Sitas, Facell-Norman, Carrara et al., 2000). Maiman, Fruchter, Clark et al. (1997) argued that the mode of transmission of the HIV and HPV are similar which may create a relationship between CaCx and HIV status of the patient since HPV causes the CIN which finally leads to the development of CaCx.

Reports from the Sub-Saharan Africa region show that women with HIV develop CaCx at an earlier age than women who are HIV negative (Levin, Gueddari & Meghzifene, 1997; 79-83 and Moodley, M. Moodley, J. & Kleinschmidt, 2001:194-197). Gichangi et al. (2003:1963-1968) in Kenya found that young women under the age of 35 who had cervical cancer were 2.6 times more likely to be HIV positive than controls of similar age.

Temmerman, Tynadall, Kidula, et al. (1999:171-178) reported a 5 fold increase in the risk of high grade carcinoma in situ among 513 HIV positive women in a family planning clinic in Kenya.

Another study done in Uganda by Sekirime and Gay (2007:222-228) to assess whether there is an association between HIV and invasive CaCx showed that HIV infected women were younger with a mean age of 35.8 years compared to 46.5 years in the HIV negative group. They therefore concluded that HIV infection is associated with an earlier onset of invasive CaCx (Sekirime & Gray, 2007:222-228)

Hawes, Critchlow and Faye-Niag (2003:555-563) in Senegal found CaCx in 0.3% of HIV negative women compared with 1.9% with HIV 1 positive, 4.5% with HIV 2 positive women and 6.9% in dually infected women. A study in Tanzania showed that the prevalence of HIV 1 was much higher among CaCx patients than among controls. Mean ages of HIV 1 positive and negative women with CaCx were 44.3 years and 54 years respectively (Chirenje, 2005:269-276).

There are also confusing reports on whether HIV positive women are more likely to develop CaCx than HIV negative women (Moodley et al., 2006:6135; Kahesa et al., 2008:262). Moodley and his group in South Africa did not find any increase in incidence of cervical cancer in HIV positive women. According to a report by UNAIDS, Sub-Saharan Africa harbours 67% of the world's population of people living with HIV and acquired immunodeficiency syndrome (AIDS) which could also be the reason why Sub-Saharan Africa has a higher burden of CaCx compared to developed countries (UNAIDS, 2008).

In Ibadan Nigeria, a study of 221 CaCx patients was carried out and only six patients were found to be HIV positive which is only 2.7% of the total patients studied. This showed that the prevalence of HIV among invasive CaCx patience in Nigeria is low compared to other African countries (Abdus Salam, Agunnorim and Abdus- Salam II, 2008).

Human immunodeficiency virus status and stage of disease

Women infected with HIV generally present with more advanced disease. According to Maiman (1998:43-49), greater immune suppression is associated with increased incidence of high grade cervical neoplasia in HIV infected women, who may also present with invasive cervical cancer at a younger age and with more aggressive advanced stage disease compared with HIV seronegative women.

Abdus-Salam et al. (2008) in their discussion also highlighted that there are suggestions that HIV infected women with cervical cancer are more likely to have advanced stage of the disease at presentation and have a higher recurrence rate than non HIV infected women. In a report by Namagembe, (2007), it was noted that younger women in Uganda were presenting with advanced disease compared to previous years. This has been attributed to immune suppression from HIV/AIDS. In terms of histology, CaCx in HIV positive patients has been described by some authors as aggressive but the relationship with histology and grade of tumour in HIV setting is not well established (Northfelt, 1994:8.33; Maiman, 1998:43-49).

2.3.5 Socio-economic status

According to ZMHCW (2009:30-96) factors that determine the socio-economic status of an individual are food availability, security, safe water and sanitation, hygiene and employment. However the dictionary defines socio-economic status as an individual's position within a hierarchical social structure. It depends on a combination of variables including occupation, education, income, wealth and place of residence, (Hirsch Jr, Joseph, Trefil et al., 2002).

Worldwide women of low socio-economic status have a greater risk of cervical cancer (Anorlu, 2008:41-49). Cervical cancer is often referred to as the disease of poor women (Munoz, et al., 2002:1093-1103) and poverty is endemic in Africa (Denny, 2005:1204-1212), implying that high incidence of invasive CaCx is expected in the African continent. About 60-75% of women in sub-Saharan Africa who develop cervical cancer live in rural areas, and mortality is very high (Parkin et al., 2002). Many of these women who develop cervical cancer are untreated, mostly due to lack of access (financial and geographical) to health care (Parkin et al., 2003).

A study done in Mali, West Africa showed that within a population widely infected with HPV poor social conditions were the main cofactors for cervical cancer (Bayo et al., 2002 :202-209). Poverty and its ramification is also a very important barrier to the prevention and treatment of CaCx.

A study done in Lahore Pakistan at Sheik Zayed Federal Post Graduate Medical Institute and hospital from January 1998 to December 2000 revealed that 80% of the invasive CaCx patients belonged to the group considered to be of a low socio-economic status. These findings were not comparable to those of Varghese, Amma, Chitrathara et al. (1999:281-2830) in which 57 % of the patients were in the low income category whose monthly income was under US$15. In India the prevalence and burden of cervical cancer was much higher among women of low socio-economic status as well as among rural women (Kurkure & Yeole, 2006; Vallikad, 2006). The reason for this was attributed to the lack of awareness of the risk factors of cervical cancer where HPV infection and precancerous lesions go unnoticed and develop into full blown cancer before women realise they need to go for medical help.

Mcfadden, McConnel, Salmond et al. (2004) carried out a study in New Zealand during 1988 to 1998 and demonstrated that there is a statistically significant and positive association between the increasing incidence of cervical cancer and increasing socio-economic deprivation. This was concluded to be due to inequitable screening. Carstairs and Morris (1991) identified that the incidence of CaCx in the most deprived group of the Scottish population was twice that of the most affluent group in the same country. Another study carried out in West Scotland indicated the same positive correlation between socio-economic status and the incidence of cervical cancer as was noted by Mcfadden et al. (2004) in New Zealand. Women aged 45 years and above living in deprived areas were found to be more likely to present with later stage tumours and to survive less well than young patients from more affluent parts of the region (Lamont, et al., 1993:351-352). In this study it was identified that the relationship between stage at presentation and socioeconomic status was stronger as compared to the relationship between socio-economic status and age of patient. The higher incidence of CaCx in most disadvantaged areas reflected life style factors such as sexual behaviour, smoking and failure to detect precancerous changes by screening.

Kasule (1989:393-399), during a study done in Harare, Zimbabwe between January 1981 and December 1983 showed that CaCx was the commonest type of cancer in African women who were 99% semiliterate rural women of low socio-economic status and who presented in 76% of the cases with advanced disease.
The same author recommended that the most practical way of preventing cervical cancer in Africa is to have intensive health education in rural areas to make women aware of the symptoms of the disease.

2.4 Chapter summary

Presentation patterns of invasive CaCx in Zimbabwe may not be different from most of the recorded literature where invasive CaCx is said to be the commonest type of malignancy affecting the African women. These women normally present late for treatment because of a lack of screening since most authors have concluded that in most African countries there is limited screening due to lack of resources. One of the important recommendations given by some authors in the reviewed literature was that the governments of African nations should mobilize resources towards CaCx screening and awareness campaigns so that invasive CaCx can be diagnosed in its early stages.

CHAPTER 3

RESEARCH METHODOLOGY

"Would you tell me please, which way I ought to go from here"? asked Alice. That depends a great deal on where you want to go to", said the cat. Lewis Carroll (1865) in Bowling (2009:1)

3.1 Introduction

Research methodology is a description of the way the investigations are carried out in order to identify answers to the research questions (Heffner, 2004). This chapter starts with the research questions then gives an explanation of the research philosophy, research design, study population, sample selection, data collection, data analysis, validity and reliability of study and the ethical considerations.

3.2 The research questions

The main research question of this study is: Are there any changes in the presentation pattern of invasive CaCx in Zimbabwe? This is further divided into the following sub questions:

1 What are the presentation patterns of invasive CaCx among the Zimbabwean women presenting to the major cancer treatment referral centre in Zimbabwe in terms of histology, stage of the disease, ages of patients, HIV status and socio-economic status?

2 What is the trend in the presentation pattern of invasive CaCx in terms of the study variables during the period of study?

3 Are there any correlations that exist among the study variables?

In order to answer these questions the researcher adopted a suitable research philosophy and design.

3.3 Research philosophy

In conducting this study it is important to understand the research philosophy that will be adopted.

There are three views of research philosophy which are positivism, realism and interpretivism (Saunders, Lewis & Thornhill, 2003). The positivist approach believes that the social world exists externally and its properties should be measured through objective methods rather than being inferred subjectively through sensation, reflection or intuition (Smith, Harre & Lewis, 2003). Realism recognizes the importance of understanding people's socially constructed interpretations and meanings or subjective reality within the context of seeking to understand broader social forces, structures or processes that influence the nature of people's views and behaviour (Saunders et al., 2003). The same authors described interpretivism as being associated with social construction which is critical to positivism and argue that rich insight into the complex world is needed. In this study the positivist approach was adopted where the researcher is supposed to take up the role of an objective analyzer of the study variables and make detached interpretations in a value-free manner emphasizing on a structured research design that could be replicated in the similar setting (Gill & Johnson, 1997). In so doing the positivist way of conducting research was implemented through quantifiable observations that lead to statistical analysis.

3.4 Research design

The research design was a retrospective cohort survey using the documentary method of collecting historic data at a cancer treatment referral centre in Zimbabwe. The presentation patterns of CaCx considered in this study are histology of the disease, stage of the disease, age of the patient, HIV status of the patient and socio-economic status for the period 1998 to 2010.

3.4.1 Socio-economic status

In this research socio-economic status was assessed using two variables which are area of residence and employment status of the patient. To justify the selection of the two variables the description of social health determinants in Zimbabwe as stated in ZMHCW, (2009:30-96) were adopted. In the ZMHCW (2009:30-96) description, social determinants of health in Zimbabwe were described as food availability, security, housing, safe water and sanitation, hygiene and employment.

The area of residence is available in the patient's file and is an indicator of whether or not there is safe water and sanitation as well as giving an indication of possible hygiene levels and security. Employment status is usually recorded and can be used to determine whether there is enough income for housing and food. Socio-economic status was then categorized into three classes which are low, middle and high socio-economic status as follows:

- Low socio-economic status: not employed and resides in the rural areas.
- Middle socio-economic status: not employed and resides in the city or employed and resides in rural areas.
- High socio-economic status: employed and resides in the city.

3.4.2 Retrospective survey

Documentary data that was already in existence from the study site was used. According to Bowling, (2009) comprehensive and systematically collected data that has been kept over time can provide important information that can form the basis for one to design descriptive and analytical research studies. Data from patients' files in a hospital setting is considered authentic because management of the patient is based on such data. However there was very little control on the type of data because it was secondary data collected for other purposes that are not necessarily for showing the presentation pattern in terms of histology of the disease, stage of the disease, age of the patient, HIV status and socio-economic status of the patient.

3.5 Study population

A population can be defined as a pool of interest including all the people or items with the characteristics one wishes to understand (Trochin & Land, 1982:1-6). In a practical study this pool could be theoretical but not accessible to the researcher. The researcher should then reduce the population size to the population that is accessible (Trochin, 2006). In this study the theoretical population was all the new patients registered at the study site since its inception. However since patients' folders for all these years were not accessible, the researcher identified the period from which it was possible to get most of the patients' folders, (1998) to the time when the study was being undertaken (2010) as the study population.

This period (1998 to 2010) was then adopted as the study period in order to satisfy a condition by Polger and Thomas (2000) which states that studies that involve changes in patterns should be done over a reasonably long period of time in order to identify any changes that might exist.

3.5.1 Sample selection

Sampling is the process of selecting units (e.g., people, organizations) from a population of interest such that the study of the sample enables the researcher to generalize the results to the population from which the sample came (Trochin, 2006). Researchers rarely survey the entire population for two reasons which are high costs and the time spent to study the whole population (Mouton, 1996).The population of this study was all new invasive CaCx patients registered for treatment at the study site from 1998 to 2010. This population was quite big considering that more than hundred new invasive CaCx patients are registered every year at the institution. This then called for sample selection.

In selecting a sample it is important to understand to whom you want to generalize the findings (Trochin, 2006). The same author also indicated that in most social science researches the researcher is not interested in those that participated in the study only but may want to generalize the findings to the whole population. This principle was also adopted in that the findings of this research could be generalized to all CaCx patients in Zimbabwe.

A model described by Trochin (2006) was adopted in selecting the study sample. In this model the theoretical population was identified in terms of years studied (time of inception of the centre to 2010) and was reduced to the accessible population (1998-2010) which is the study population in which the sample has to be selected. The list of all the years in the study period was noted (the sample frame from 1998 to 2010) and from this list the years to be studied (sample) were selected. Systematic sampling was used where years that are four years apart were selected starting from 1998 as the base year. Most studies of cancer presentation patters generally adopt five year intervals as change is not usually obvious from one year to the next (Moore, 2008).

In a thirteen (13) year period, it was better to use a four year interval which is closer to a five year interval in order to strengthen the data.

To give weight to the research all the patients in every year selected were considered for the study. The model that was adopted in identifying the population and the study sample is illustrated in figure 3:1

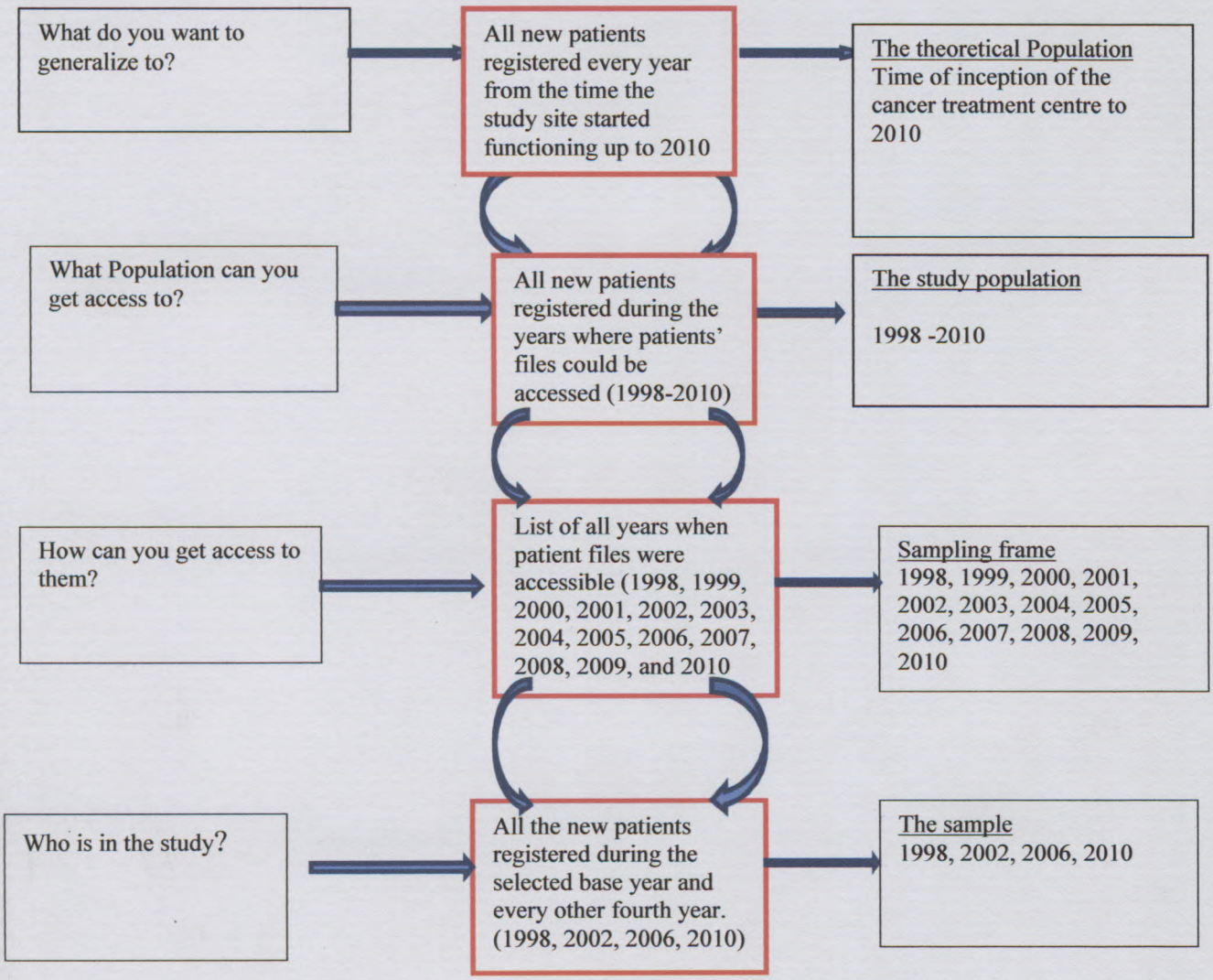

Figure 3.1: Schematic model for population and sample identification

3.5.2 Inclusion criteria

The study site selected was the main cancer treatment referral centre in Harare the capital city of Zimbabwe. This has been the only functioning cancer treatment centre in Zimbabwe from about 2000 to 2010. All the files of the selected years were considered as suitable for the study. Only Zimbabwean patients participated in the study.

3.5.3 Exclusion criteria

Foreign patients from neighbouring countries were excluded because the intention was that the findings could be generalized to the Zimbabwean population.

3.6 Data collection instruments

Patients' files and the departmental registers were the sources of the required historic data. The variables observed in every patient's file were the histology of the disease, stage of the disease at presentation, age of patient, HIV status of the patient employment status and the residential area. The last two variables were the ones used to define the socio-economic status. Observation checklists in appendix C were used.

3.7 Data analysis

Data analysis involved the use of descriptive and inferential statistics. Excel version was used to analyze the data. Data about the presentation patterns was first presented in tabular form for the different years during the period of study.

3.7.1 Statistical analysis

The following analytical tools were used; histograms, trend analysis and correlation analysis and Chi square test.

Chi square test

The Chi square test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more

categories (Sharp, 1979). The same author stated the requirements for Chi square test as; quantitative data, one or more categories, independent observations, adequate sample size (at least 10), simple random sample, data in frequency form and that all observations must be used.

Expected frequencies

When using Chi square test one of the ways in which expected frequencies could be determined is by hypothesizing that all the frequencies are equal in each category and in this case the expected frequencies for all the categories will be the same.
This is calculated by dividing the total observed frequencies by the number of categories (arithmetic mean). The other method used to derive the expected frequencies is on the basis of some prior knowledge of the expected proportions in each category. The known proportions are multiplied by the observed frequencies in the different categories in order to get the expected frequency for each category (Sharp, 1979). In this study the Chi square test was used to test whether there are any changes in the presentation pattern in terms of the study variables. The expected frequencies were determined by calculating the arithmetic mean of the distribution since it was assumed that if there is no change in patterns then the frequencies in all the categories should be the same. The formula for the Chi square test is stated in appendix H.

Variables analyzed were:

1. Total number of patients presenting for treatment.

Multiple bar charts were drawn to illustrate the year with the highest percentage of invasive CaCx. Trend analysis of the number of CaCx patients was done using 1998 as the base year. The Chi Square test was carried out with a 95% level of significance to assess whether there was any significant change in the number of patients presenting for treatment during the study period.

2. Histological type.

In terms of histological type, Parkin (1994:540) pointed out that 86% of the cancers of the cervix are SCC and 3.4 % adenocarcinoma. Three histological classes were considered in this study which are; SCC, adenocarcinoma and other types. Multiple bar charts, trend analysis and Chi square tests were performed at 95% level of significance.

3. Stage of disease.

FIGO staging was used to group the different stages of the CaCx patients at presentation. The stages of the disease for every participant in the targeted years were recorded, from stage I to IV. Multiple bar charts, pie charts and trend analysis graphs were used. Chi square tests were performed with the 95% level of significance.

4. Ages of patients.

Ages of CaCx patients were grouped into classes as shown in table 3:1. The range of years that was adopted was such that no age group was left out of the study.

Table 3.1: Patients' Age Classes

Age Class Width (years)	Middle Age of Class (years)
10 to < 20	15
20 to < 30	25
30 to < 40	35
40 to < 50	45
50 to < 60	55
60 to < 70	65
70 to < 80	75
80 to < 90	85
90 to < 100	95

Histograms and trend analysis graphs were used in the analysis. Chi Square tests were done with 95% level of significance.

5. Human immunodeficiency virus status.

Coding was used to identify patients who were (a) HIV positive, those who were (b) HIV negative and (c)those whose status was not recorded. Multiple bar charts, pie charts and trend analysis graphs were generated to show the presentation pattern in terms of HIV status. Chi Square tests were performed with 95% level of significance.

6. Socio-economic status

The new registered patients were classified into the low socio-economic status, the middle socio-economic status and the high socio-economic status groups as defined in section 1.3.5. Pie charts, trend analysis and Chi square test were performed at 95% level of significance.

3.7.2 Correlation analysis

Correlation analysis was done to assess the relationship between the variables (Heffner, 2004). This is one of the easiest descriptive statistics to understand and is widely used. The extent of the relationship is expressed using the correlation coefficient denoted by "r". The correlation coefficient indicates the intensity and the strength of the relationship. In using correlation tests care has to be taken to avoid the causality mistake. This is a type of mistake which comes about as a result of interpreting relationships between the analyzed factors using the outcome of the correlation test and not considering the context in which it happens (Heffner, 2004). In the study the research context is outlined in order to minimize the causality mistake. The Pearson's correlation coefficient was used and the formula is stated in appendix H. The different study variables were coded as shown in table 3.2.

Table 3.2: Variables and coding

Variable	Coding
HIV status	A
Stage of Disease at Presentation.	B
Patient's age at Presentation.	C
Histological Type of the Invasive Cancer of the Cervix	D
Socio-economic Status	E

To make sure that every relationship among the variables was tested table 3.3 was used to identify the pairs of variables to be correlated.

Table 3.3: Correlation tests

Starting Variable	Correlation Test 1	Correlation Test 2	Correlation Test 3	Correlation Test 4
A	B	C	D	E
B	C	D	E	
C	D	E		
D	E			

3.8 Reliability and validity of the Study

The validity and reliability of any test or measuring device used in the data collection process is important. (Heffner, 2004).The author indicated that in the same way that it is wrong to use a mathematics test to assess verbal skills it is also wrong to use measuring devices in research that are not measuring what is supposed to be measured.

3.8.1 Validity of the Study

Heffner (2004), defined validity as the degree to which a measuring device is truly measuring what it is intended to measure. In this study the researcher was concerned about two types of validity which are external and internal validity.

External validity

This refers to the extent to which results of the study are generalizable or transferable to the whole population (Brink, van der Walt & van Rensburg 2006:118-119). External validity in this particular study was achieved by consideration of the selection of the study site such that the largest functional cancer treatment referral centre in Zimbabwe was selected. The sample size was also large enough (<25% of the population) to be representative of the study population (Heffner, 2004).

Internal validity

Internal validity takes into consideration the rigor with which the study was conducted for example the study design, the care taken to conduct measurements and decisions concerning what was and what was not measured. It also considers the extent to which

the designers of the study have taken into account alternative explanations for any casual relationships they explore (Huitt, 1998). To achieve this, the researcher consulted a statistician regarding the statistical tests adopted in the study. The casual relations explored were not just interpreted in terms of statistical analysis only but the context of the research was considered. Internal validity was also achieved by using the actual hospital data since the hospital data of patients is assumed to be true and consistent which means that the research findings will be a true reflection of what has happened in terms of CaCx presentation patterns during the study period.

3.8.2 Reliability of the study

Reliability considers the consistency of a test, survey, observation or other measurement device (Heffner, 2004). Aaker, Kumar and Day (1996) argue that all samples from the same population may not produce the same results and that there tends to be a variation due to some level of error. Heffner (2004) on the same note defined reliability as an indication of the extent to which a measure contains variable errors which are errors that vary from one observation to another.

The same author then went on to suggest that the variable error depends on the size of the sample such that the larger the sample the lower the error. To increase the level of reliability the researcher considered all the patients in each of the four years selected for study. The research design which is a retrospective documentary study improved the reliability of the study in that the records of past events do not change over time making the study findings to be consistent.

3.9 Ethics

The three ethical approaches which are liberitarian, duty based and utilitarian were considered, (Hope, Savulescu & Hendrick, 2003). To fulfil the liberitarian approach the hospital has a culture of asking patients' consent to have their records used for educational purposes since the study site is a training institution. Those patients not willing to have their records used are told to state this on their consent forms and are assured that no privileges will be withdrawn from them. No patient folders indicated that the patient did not give permission for use of their data and hence all participant information could be admitted to the data set.

The duty based professionalism approach was achieved by making sure that information from the patients' records was kept private and confidential. The patients' hospital identification numbers which are recorded in numerical form were coded and the codes are known to the researcher only. The reason for this was so that the patients' information remains confidential because no other person can trace back using the codes to the actual files except for the researcher. The utilitarian approach was adopted by making sure that future patients will benefit from the findings of this research since the main thrust of the study is to assist policy makers in health to come up with policies that will impact positively on CaCx management.

Permission was sought from the Clinical Director for the hospital in question through the Head of Department of the study site. Clearance was only granted after confirmation that the researcher will not be violating medico-ethical issues in carrying out this research.

The research proposal was reviewed by the Cape Peninsula University of Technology (CPUT) Health and Wellness Sciences Research Ethics Committee to confirm that the research process had taken into account the required ethical principles and an approval certificate was issued on 12 October 2010 with reference number REC- 230408-014.

3.10 Chapter conclusion

The research methodology chapter is a road map of what was done to answer the research questions using an appropriate study design.
Having clearly described the procedures followed in carrying out the study in this section, the next chapter will present the results as a detailed analysis of the data collected using the appropriate analytical tools.

CHAPTER 4

DATA PRESENTATION RESULTS AND ANALYSIS

In general, descriptive and exploratory research questions lead to the collection of data in the form of numbers ... To many researchers, these numbers (often referred to as raw data) appear to be a frightening maelstrom of information without order or meaning. If they are to be used to inform health care practice these raw data must be organised, summarized and presented in a form that succinctly communicates their important features and their underlying meaning (Sim, & Wright 2000:169)

4.1 Introduction

This chapter presents the results and analysis of data in order to give meaning to the collected data so that it can satisfy the following objectives:

Main objective
To identify the presentation patterns of invasive CaCx in Zimbabwe.

Sub objectives

1 To identify the presentation patterns of invasive CaCx among Zimbabwean women presenting to the major cancer treatment referral centre in Zimbabwe in terms of histology, stage of the disease, ages of patients, HIV status and socio-economic status.
2 To analyze the presentation patterns of invasive CaCx for the period under study using trend analysis.
3 To explore any correlation that might exist between the following variables: histology of the disease, stage of the disease, age of the patients, HIV status of the patients and socio-economic status

The sample of years studied are 1998, 2002, 2006 and 2010.

4.2 Patients registered per year.

The registered patients considered in this study were those patients who presented for the first time with a confirmed diagnosis of invasive CaCx.
The number of registered patients for 1998, 2002, 2006 and 2010 were 182, 172, 181 and 336 respectively.

The total number of patients registered during each of the years 1998, 2002, 2006 and 2010 were expressed as a percentage of the total number of newly registered patients for the four years of study. A Line graph of the actual numbers of patients registered per year was drawn to illustrate the trend in the number of new patients being registered.

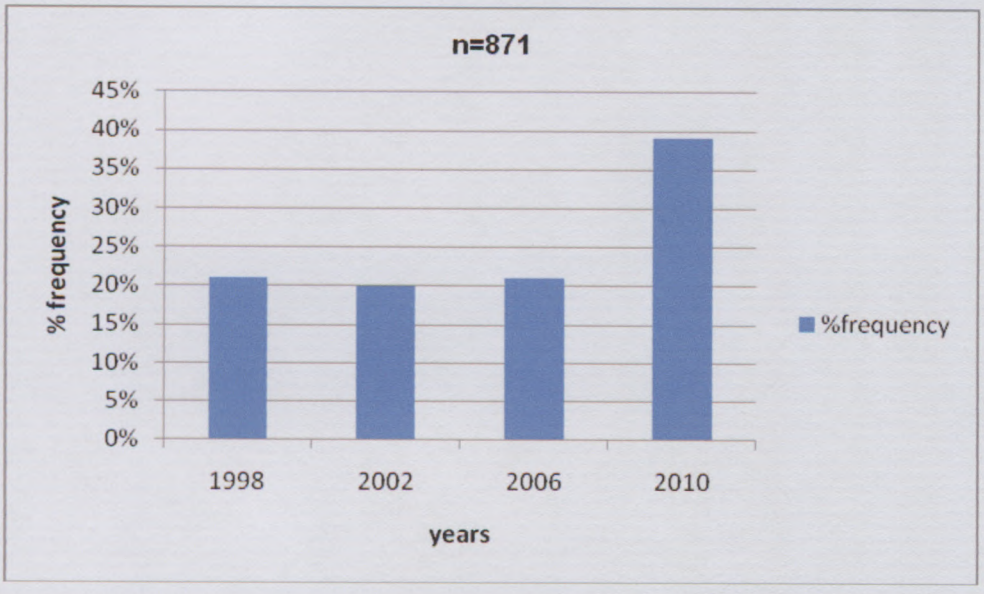

Figure 4.1: Proportions of registered patients

The year with the highest percentage frequency of invasive CaCx patients who registered was 2010 with 39%. The percentages for 1998, 2002 and 2006 were almost constant and were 21%, 20% and 21% respectively.

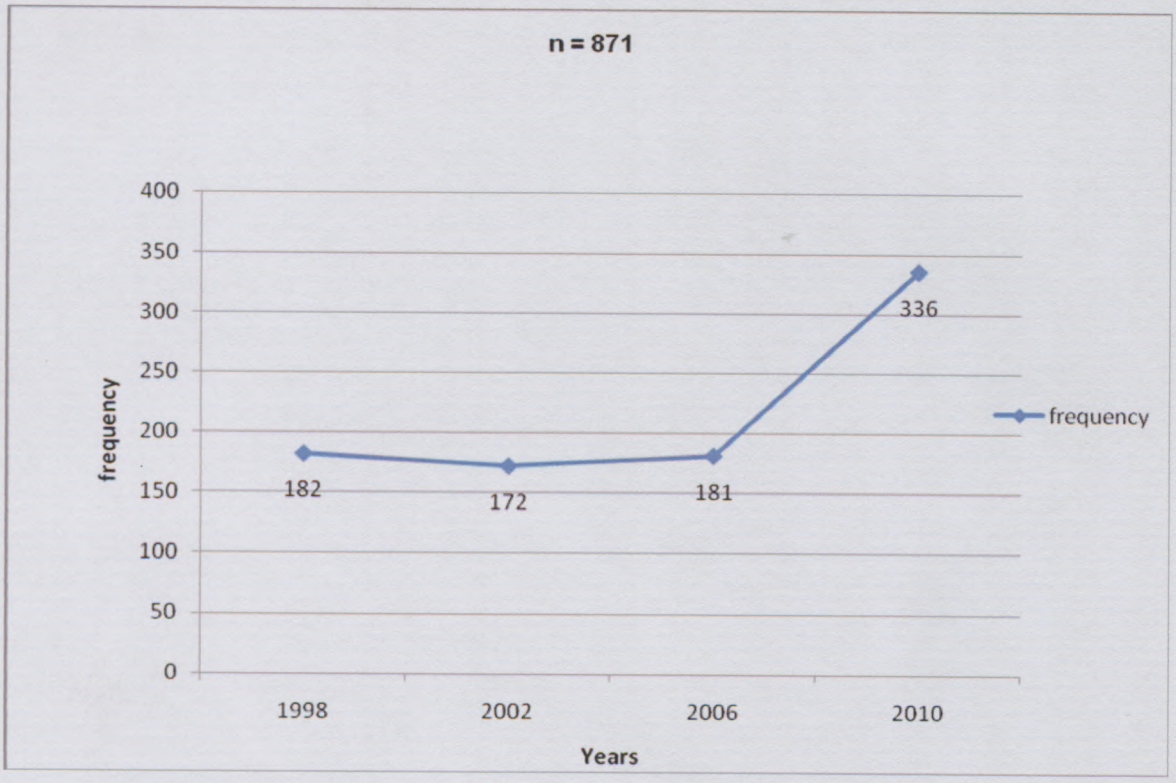

Figure 4.2: Registered patients (1998-2010)

The newly registered patients for 1998, 2002, and 2006 were almost constant, that is 182, 172 and 181 respectively and then there was an outlier in 2010 of a frequency of 336. In order to find out whether the change was abrupt or whether it was gradual during the years between 2006 and 2010 another line graph (figure 4.3) was drawn with the number of patients who registered in 2007, 2008 and 2009 included.

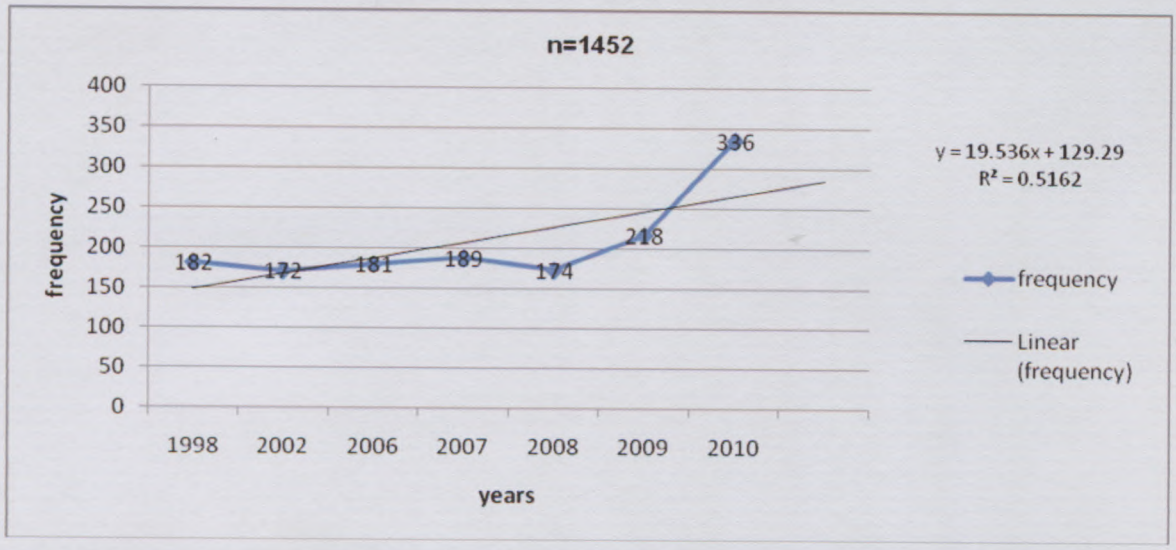

Figure 4.3: Registered patients 1998-2010 (2007, 2008 & 2009 included)

The frequencies for 2007 (189), 2008 (174) and 2009 (218) were within the same range with the other 3 years (1998, 2002 and 2006), and 2010 still remained an outlier with 336 patients being registered. After adding the other three consecutive years from 2006 a trend could be followed and the trend line had a gradient of 19.36 and an R^2 value of 0.5162.

Table 4.1: Registered patients per year and the available files

Years of study	1998	2002	2006	2010	Total
Total Number of patients registered	182	172	181	336	871
Number of patients whose files were available for study	177	138	151	240	706
% of number of available files	97%	80%	83%	71%	81%

Out of the sample years of study 2010 had the lowest percentage (71%) of available patients' files. The year 1998 had the highest percentage (97%) of available patients' files. The years 2002 and 2006 had 80% and 83% of the registered patients' files available respectively.

4.3 Histology of the disease

Table 4.2 shows the distribution of invasive CaCx patients in terms of the histology of the disease for the total number of the available patients' files.

Table 4.2: Histological types (unrecorded included)

	1998		2002		2006		2010		total		Av. %
histology	Freq	%	Freq	%	freq	%	freq	%	freq	%	freq/yr
SCC	170	96%	88	64%	144	95%	210	88%	612	87%	86%
Adeno	6	3%	7	5%	7	5%	17	7%	37	5%	5%
Other	1	1%	8	6%	0	0%	4	2%	13	2%	2%
Unrecorded	0	0%	35	25%	0	0%	9	4%	44	6%	7%
Total	177	100%	138	100%	151	100%	240	100%	706	100%	100%

The percentage frequencies of files with unrecorded histology for 1998, 2002, 2006 and 2010 were 0%, 25%, 0% and 4% respectively. The year 2002 had a high percentage frequency (25%) of patients with unrecorded histology.

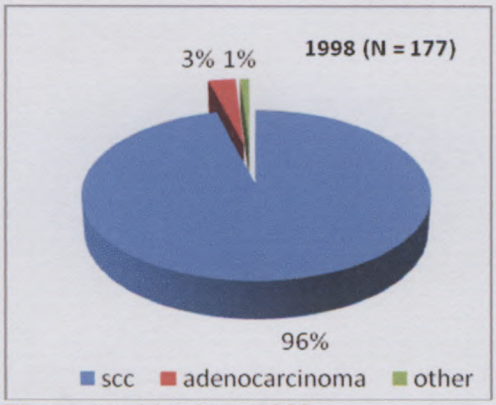

Figure 4.4: histology 1998

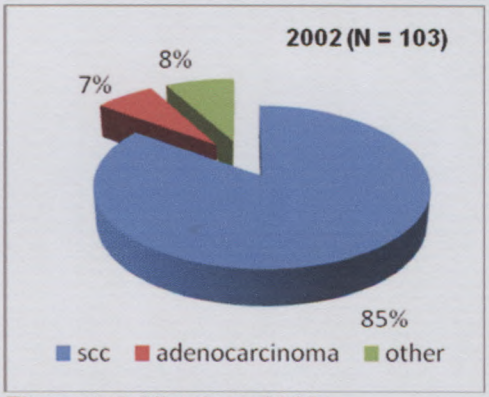

Figure 4.5: Histology 2002

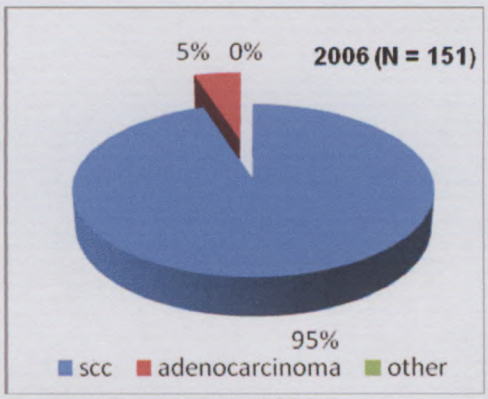

Figure 4.6: Histology 2006

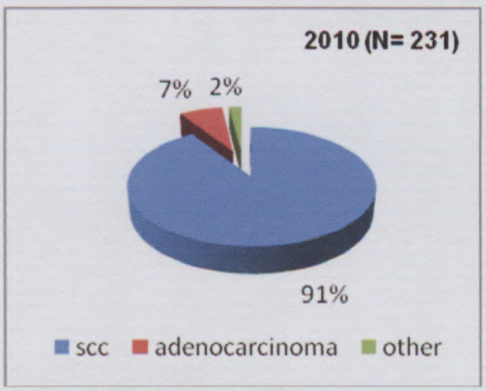

Figure 4.7 Histology 2010

Figures 4.4, 4.5, 4.6 and 4.7 show the distribution of invasive CaCx patients in terms of histological type. In calculating percentages for the above figures patients' files with unrecorded histology were not considered.

SCC had the highest percentage frequency in all the four years with 96% in 1998, 85% in 2002, 95% in 2006 and 91% in 2010. The average percentage frequency for SCC over the 4 years was 91.75%.

Adenocarcinoma was the second highest in occurrence with 3% for 1998, 7% for 2002, 5% for 2006 and 7% for 2010. The average percentage frequency for the adenocarcinoma type of histology was 5.5%.

The other histological types were the least common with 1% in 1998, 8% in 2002, 0% in 2006 and 2% in 2010. The average occurrence for the other histology types was 2.75%.

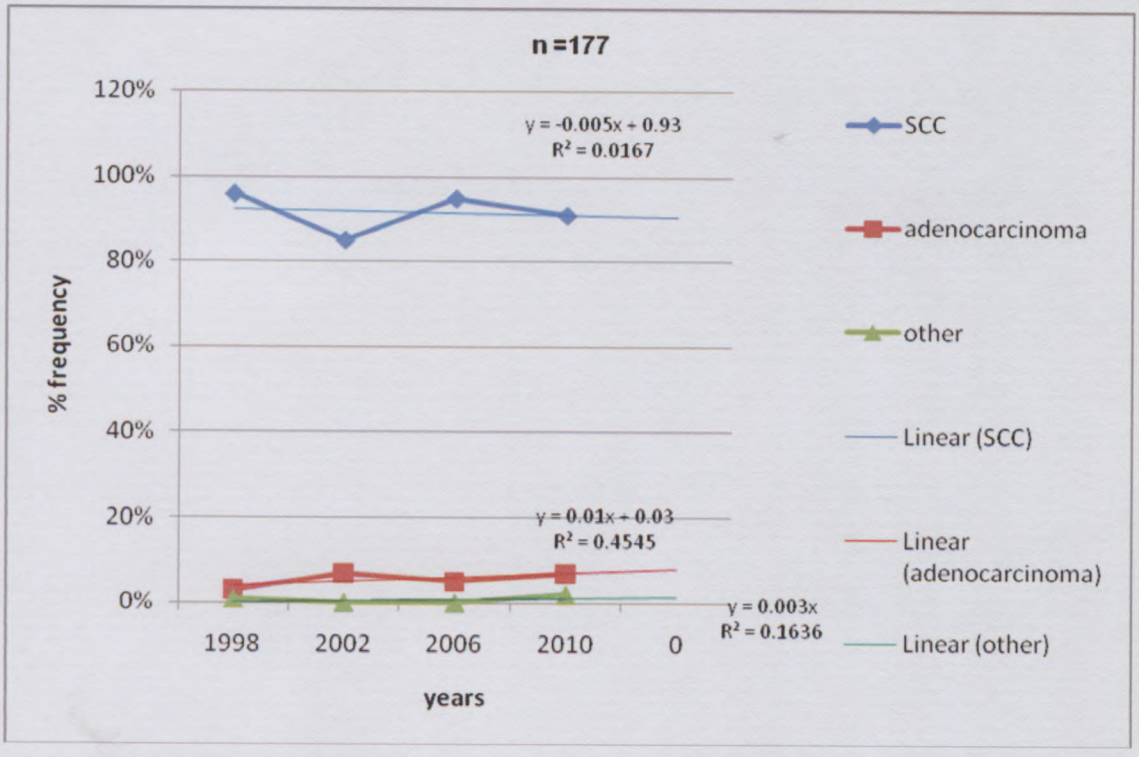

Figure 4.8 Histology (1998-2010)

The gradients of the linear trend lines for all the histology types (SCC, adenocarcinoma and other histological types) were almost zero with the gradient for SCC line being – 0.005, the trend line representing adenocarcinomas had a gradient of 0.01 and the trend line for other histology types had a gradient of 0.003. The R^2 values for the SCC, adenocarcinoma, and other types of histology were 0.0167, 0.4545 and 0.1636 respectively.

4.4 Stage of the disease

In staging invasive CaCx the FIGO staging was used. In all the analysies stages IA and IB were combined to form one category because not many patients presented with such early stages at the study centre. Table 4.3 showed the distribution of invasive CaCx patients in terms of disease stage with the percentage frequency of patients' files with unstaged disease being considered.

Table 4.4 was drawn to show the percentage distribution in terms of disease stage for only those patients' files with recorded stages of disease. Figures 4.9, 4.10, 4.11, 4.12, and 4.13 were analysed using the percentage frequency of only those files with recorded stages. The trend in terms of the stage of disease at presentation was illustrated using line graphs in figure 4.14 and 4.15.

Table 4.3: Distribution in terms of stage (unstaged included)

Stage	1998		2002		2006		2010		Total		Av. %
	Freq	%	Freq	%	Freq	%	Freq	%	freq	%	Freq/yr
IA & IB	3	2%	5	4%	2	1%	5	2%	15	2%	2%
IIA	16	9%	9	7%	23	15%	13	5%	61	9%	9%
IIB	48	27%	25	18%	21	14%	62	26%	156	22%	21%
IIIA	20	11%	11	8%	31	21%	45	19%	107	15%	15%
IIIB	59	33%	33	24%	36	24%	34	14%	162	23%	24%
III(A+B)	24	14%	23	17%	27	18%	35	15%	109	15%	16%
IV	7	4%	17	12%	11	7%	30	13%	65	9%	9%
Unstaged	0	0%	15	11%	0	0%	16	7%	31	4%	4%
Total	177	100%	138	100%	151	100%	240	100%	706	100%	100%

The percentage frequencies of patients' files with unstaged disease were 0%, 11%, 0% and 7% for the years 1998, 2002, 2006 and 2010 respectively. The year with the highest percentage frequency (11%) of patients' files with unstaged disease was 2002.

Table 4.4: Distribution in terms of stage (files with recorded stages only)

Stage	1998		2002		2006		2010		Total		Av.%
	Freq	% Freq	Freq	%freq	Freq	%freq	Freq	%freq	Freq	%freq	freq/yr
IA & IB	3	2%	5	4%	2	1%	5	2%	15	2%	2%
IIA	16	9%	9	7%	23	15%	13	6%	61	9%	9%
IIB	48	27%	25	20%	21	14%	62	28%	156	23%	22%
IIIA	20	11%	11	9%	31	21%	45	20%	107	16%	15%
IIIB	59	33%	33	27%	36	24%	34	15%	162	24%	25%
III(A+B)	24	14%	23	19%	27	18%	35	16%	109	16%	16%
IV	7	4%	17	14%	11	7%	30	13%	65	10%	10%
Total	177	100%	123	100%	151	100%	224	100%	675	100%	100%

The average percentage frequencies for stages (IA & IB) category, IIA, IIB, IIIA, IIIB, III(A+B) and IV were 2%, 9%, 22%, 15%, 25%, 16% and 10% respectively. Stage IIIB category had the highest average percentage frequency (25%) followed by stage IIB with 22%. The stage (IA & IB) category had the least average percentage frequency of (2%).

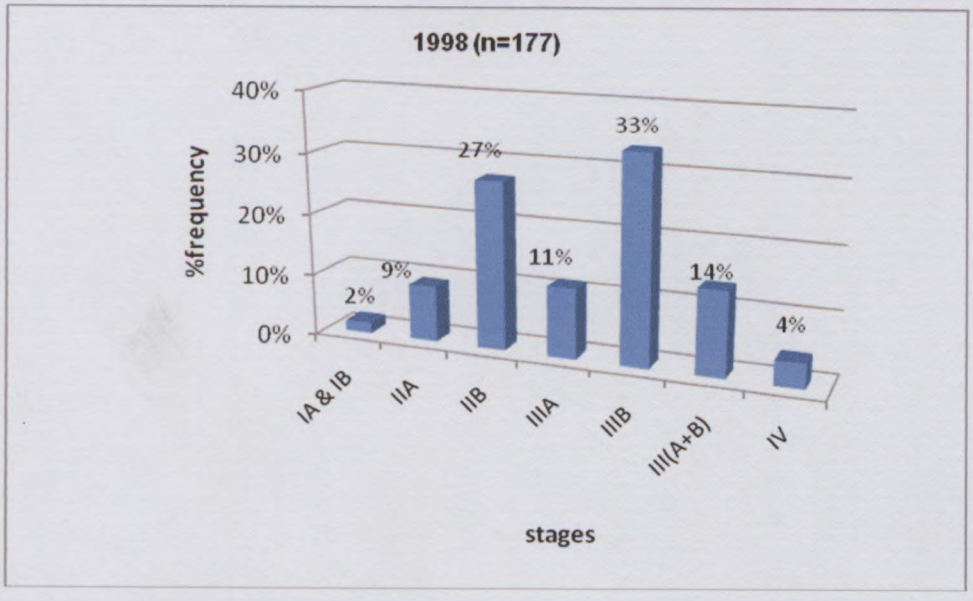

Figure 4.9:Stage of disease (1998)

The stage with the highest percentage frequency was stage IIIB (33%) followed by stage IIB (27%). Stage (IA &IB) category had the least percentage frequency of (2%).

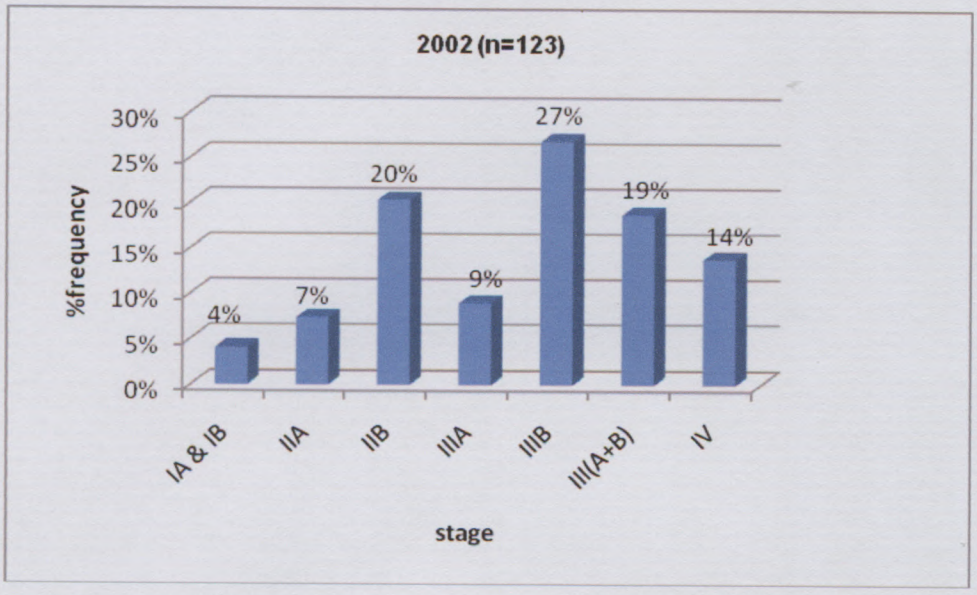

Figure 4.10: Stage of disease (2002)

Figure 4.10 shows that the stage with the highest percentage frequency was stage IIIB (27%) followed by stage IIB (20%). Stage III (A+B) had a percentage frequency of 19%. The category with the least percentage frequency (4%) was the stages (IA & IB) category.

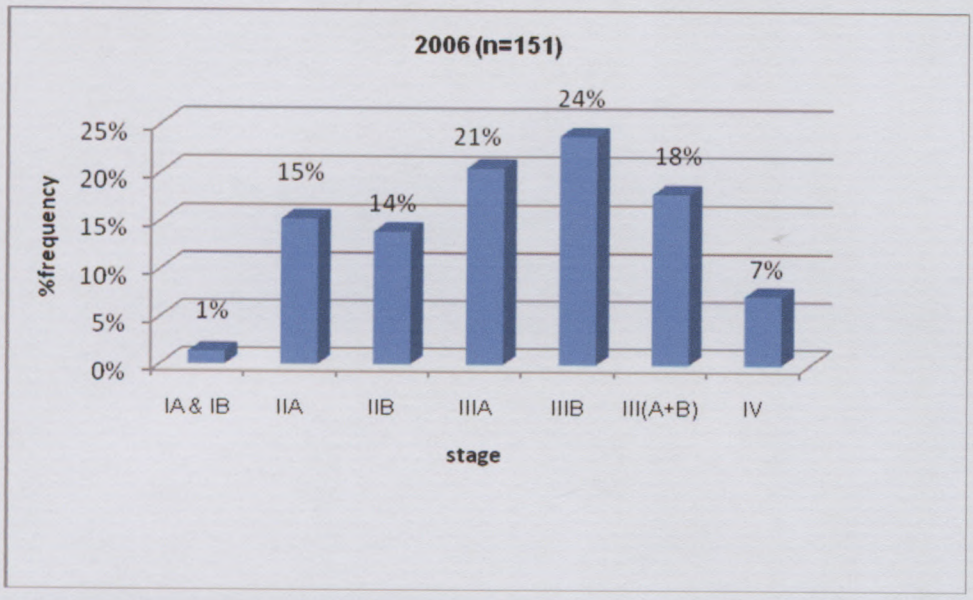

Figure 4.11: Stage of disease (2006)

In 2006 the stage with the highest percentage frequency was stage IIIB (24%) followed by stage IIIA (21%). Stage III (A+B) had a percentage frequency of 18% and stage IIB had 14%. The category for the stages (IA & IB) had the least percentage frequency of (1%).

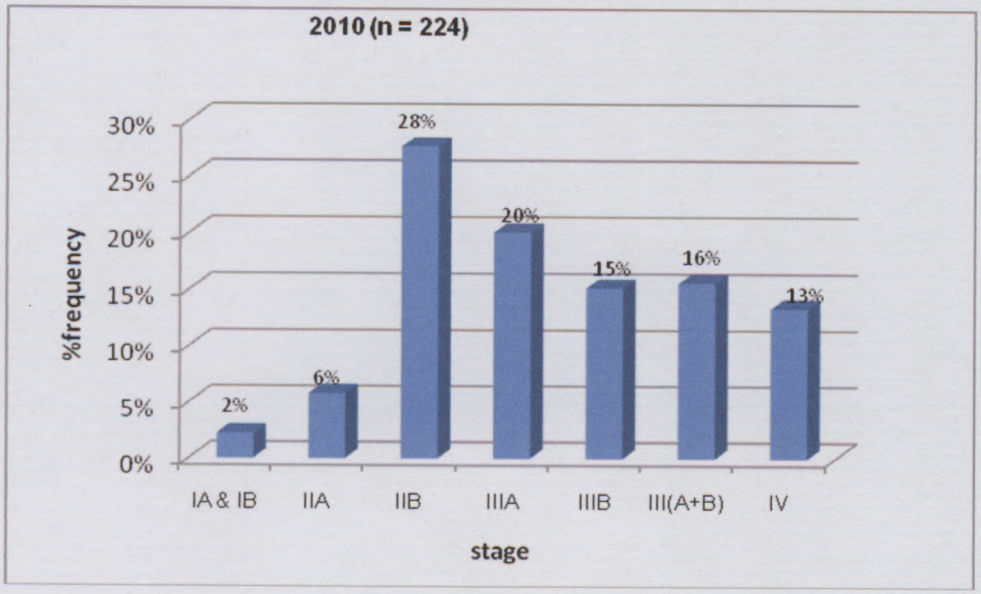

Figure 4.12: Stage of disease (2010)

In figure 4.12 the distribution pattern in terms of stage appears different from the other years (1998, 2002 & 2006). The highest percentage frequency (28%) was recorded for stage IIB followed by stage IIIA (20%) and stage IIIB had a percentage frequency of 15%. Stage III (A+B) had a percentage frequency of 16% which was higher than the percentage frequency for stage IIIB (15%). The least percentage frequency was again recorded for the stages (IA & IB) category.

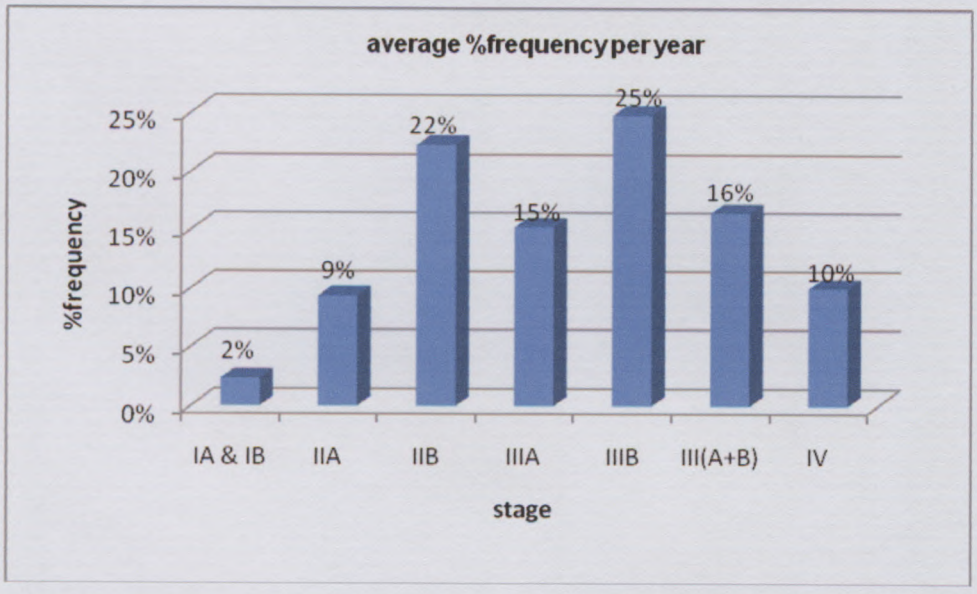

Figure 4.13: Stage of disease (average percentage frequency per year)

Stage IIIB had the highest average percentage frequency (25%) followed by stage IIB with a percentage frequency of 22%. The least average percentage frequency (2%) was recorded for the stages (IA & IB) category. The average percentage frequencies for stages IIA, IIIA, III (A+B) and IV were 9%, 15%, 16% and 10% respectively.

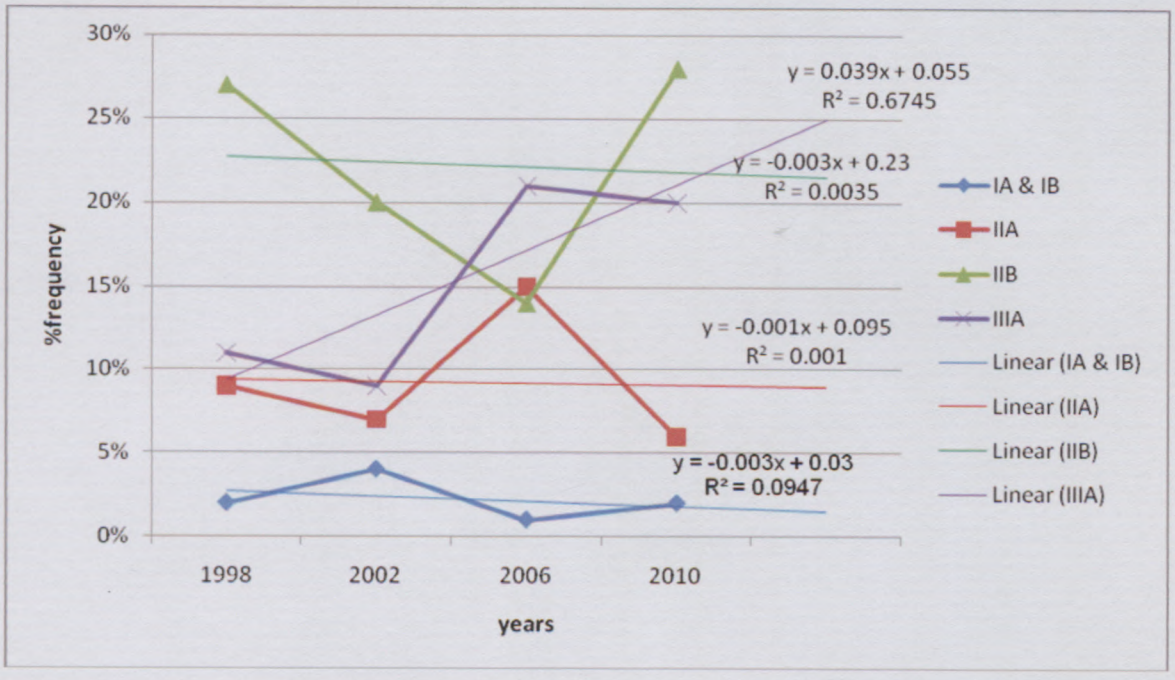

Figure 4.14 Disease stages IIIA and below (1998 – 2010)

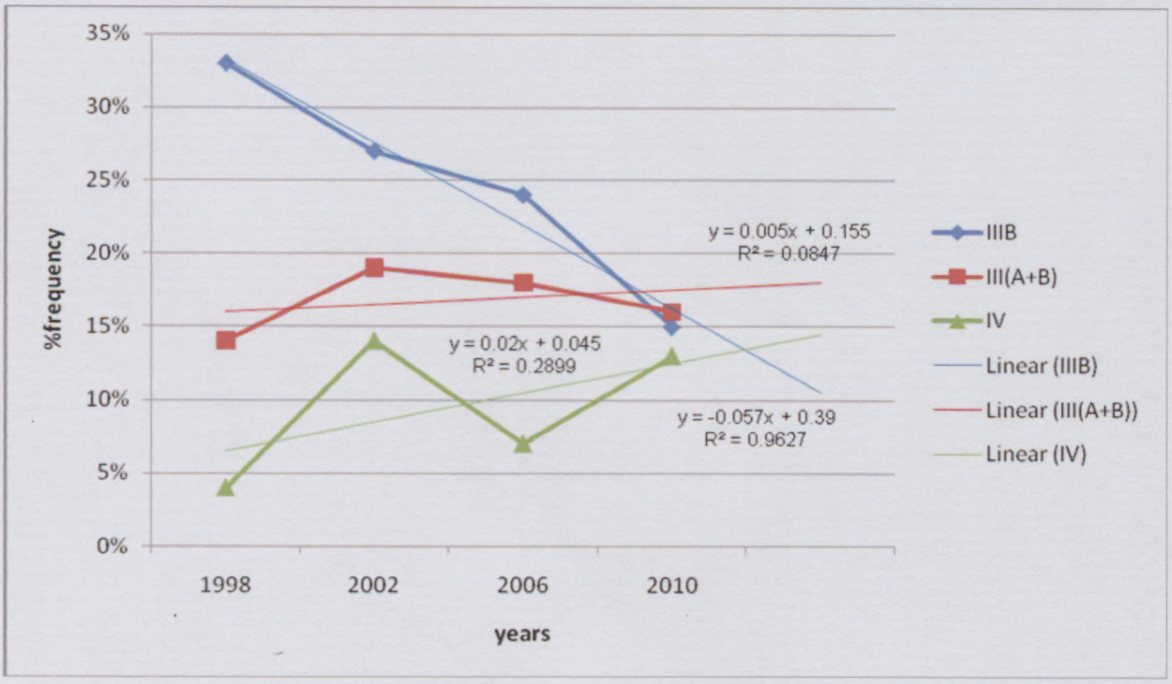

Figure 4.15: Disease stages IIIB to IV (1998 – 2010)

Figures 4.14 and 4.15 are line graphs demonstrating the trend followed by the different stages at presentation. A trend line shows change over time. The trend line position and gradient is calculated using the linear regression technique. The linear regression equation is illustrated in appendix H. The higher the gradient of the linear regression line the greater the rate of change of the variables. The position of the trend line is described by the R^2 value which describes the goodness of fit and it varies between -1 to +1. The R^2 value which is less than 0.1 in either the positive or negative direction is regarded as insignificant (NC University, 2004). The gradients of most of the line graphs were insignificant except for the gradient of the stage IIIB line (-0.057) which when rounded off to one decimal place would give a gradient of- 0.1. The R^2 values for stage III (A+B), the stages (IA & IB) category, stage IIA and stage IIB were insignificant. The R^2 values for stage IIIA (0.6745), stage IIIB (0.9627) and stage IV (0.2599) showed significant levels of goodness of fit.

4.5 Ages of patients at presentation

Histograms were drawn to demonstrate the age distribution for each of the years using the middle age of the age groups each spanning 10 years (see figures 4.16, 4.17, 4.18, 4.19).

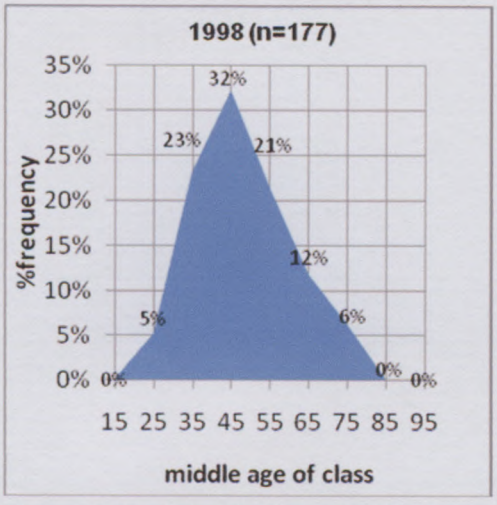

Figure 4.16: Age distribution (1998)

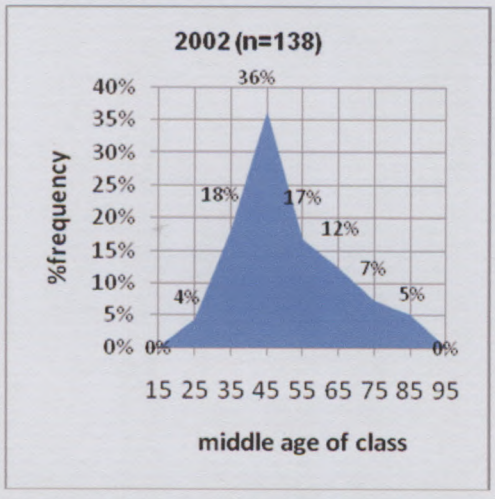

Figure 4.17: Age distribution (2002)

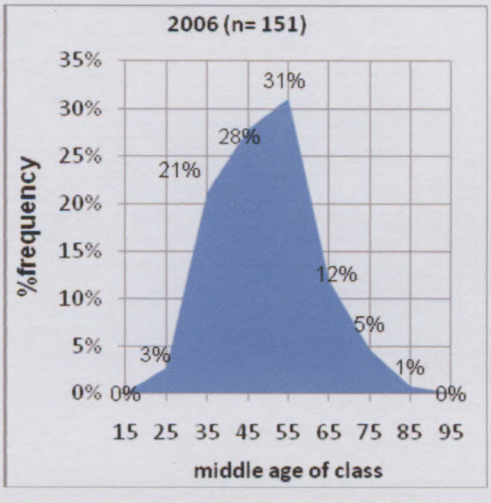

Figure 4.18: Age distribution (2006)

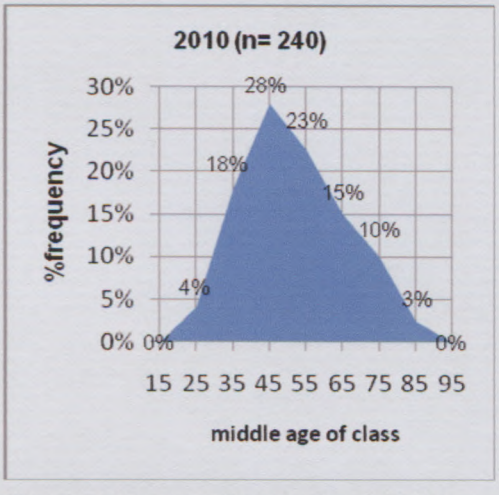

Figure 4.19: Age distribution (2010)

Figures 4.16, 4.17, 4.18 and 4.19 are histograms which show the age distribution of invasive CaCx patients for the years 1998, 2002, 2006 and 2010 respectively.

In 1998 the minimum age (22 years) was in the (20 to < 30 years) age group and the maximum age (88years) was in the (80 to < 90 years) age group. The mean, median and modal ages for 1998 were 48.8 years, 48 years, and 45 years respectively. The mean, median and mode all lie in the same age group (40 to < 50 years).

The modal age group (40 to < 50 years) had a percentage frequency of 32% followed by the (30 to < 40 years) age group with a percentage frequency of of 23%.The (40 to < 50 years) age group had a percentage frequency of 21%. The lowest percentage frequencies were recorded in the (20 to < 30 years) and the (80 to < 90 years) age groups with percentage frequencies of 5% and 6% respectively.

In 2002 (figure 4.17) the minimum age (23 years) was in the (20 to < 30 years)age group and the maximum age (88 years) was in the (80 to < 90 years) age group. The mean, median and modal ages were 51 years, 48 years and 42 years. The mean age lies in the (50 to < 60 years) age group and the median and modal ages lie in the (40 to < 50 years) age group. The modal class (40 to < 50 years) had a percentage frequency of 36% followed by the (30 to < 40 years) age group with a percentage frequency of 18%. This was closely followed by the (50 to < 60 years) age group with a percentage frequency of 17%. The lowest frequencies were recorded in the (20 to < 30 years) and the (80 to < 90 years) age groups with percentage frequencies of 4% and 6% respectively.

Figure 4.18 shows the age distribution for the year 2006. The minimum age (23 years) was in the (20 to < 30 years) age group and the maximum age (83 years) was in the (80 to < 90 years) age group. The mean, median and modal ages were 50.1 years, 50 years and 53 years respectively. All the averages (mean, median and modal ages) lie in the (50 to < 60 years) age group. The modal age group (50 to < 60 years) had a percentage frequency of 31% followed by the (40 to < 50 years) age group with a percentage frequency of 28%. The (30 to <40 years) age group had a percentage frequency of 21%. A sharp fall off of percentage frequency was observed from 31% for the (50 to < 60 years) age group to 12 % for the (60 to < 70 years) age group. The lowest percentage frequencies were recorded for the (80 to < 90 years) (1%) and the (20 to < 30 years) (3%) age groups.

The age distribution for patients who were registered in 2010 is shown in figure 4.19. The minimum age (28 years) was in the (20 to < 30) years age group and the maximum age (88 years) was in the (80 to < 90 years) age group. The mean, mediam and modal ages were 52.6 years, 50.5 years and 42 years respectively.

The mean and the median belong to the (50 to < 60 years) age group and the modal age group was (40 to < 50 years). The percentage frequency of the modal class (40 to < 50 years) was 28% followed by the (50 to < 60 years) age group with a percentage frequency of 23%. The age group (30 to < 40 years) had the third highest percentage frequency of 18%. The age groups with the lowest percentage frequency were the (80 to < 90 years) age group and the (20 to < 30 years) age group with percentage frequencies of 3% and 4% respectively.

All the four age distribution histograms for 1998 (figure 4.16), 2002 (figure 2.17), 2006 (figure 4.18) and 2010 (figure 4.19) display almost similar patterns of age distribution. The minimum ages for all the years lie in the (20 to <30 years) age group and then there is a sharp increase in percentage frequency that peaks at the (40 to < 50 years) age group followed by a rapid fall off to reach minimum percentage frequency in the age group (80 to < 90 years) The standard deviations for the four histograms for 1998, 2002, 2006 and 2010 were 12.5, 14.4, 11.8 and 13.6 respectively indicating that the age values for all the years studied have almost similar deviations from the mean. All the histograms were positively skewed with skewness values of 0.36, 0.67. 0.28 and 0.38 for the years 1998, 2002, 2006 and 2010 respectively. However the age distribution for 2002 ha d a very high positive skewness value (0.67) as compared to the other 3 years.

Table 4.5 was drawn to summerize the measures of central tendecy and dispersion for the distribution of ages for the years 1998, 2002, 2006 and 2010. Figures 4.20 and 4.21 were drawn to illustrate the trend followed by each age group.

Table 4.5: Measures of central tendency and dispersion

Measures	1998	2002	2006	2010
Mean age	48.8 years	51 years	50.1 years	52.6 years
Median age	48 years	48 years	50 years	50.5 years
Modal age	45 years	42 years	53 years	42 years
Minimum age	22 years	23 years	23 years	28 years
Maximum age	88 years	88 years	83 years	88 years
Standard deviation	12.5	14.4	11.8	13.7
Skewness	0.36	0.67	0.28	0.37

Figures 4.20 and 4.21 given below are line graphs of the age distribution for the years 1998,2002,2006 and 2010 and are drwan to illustrate the trend followed by each age group.

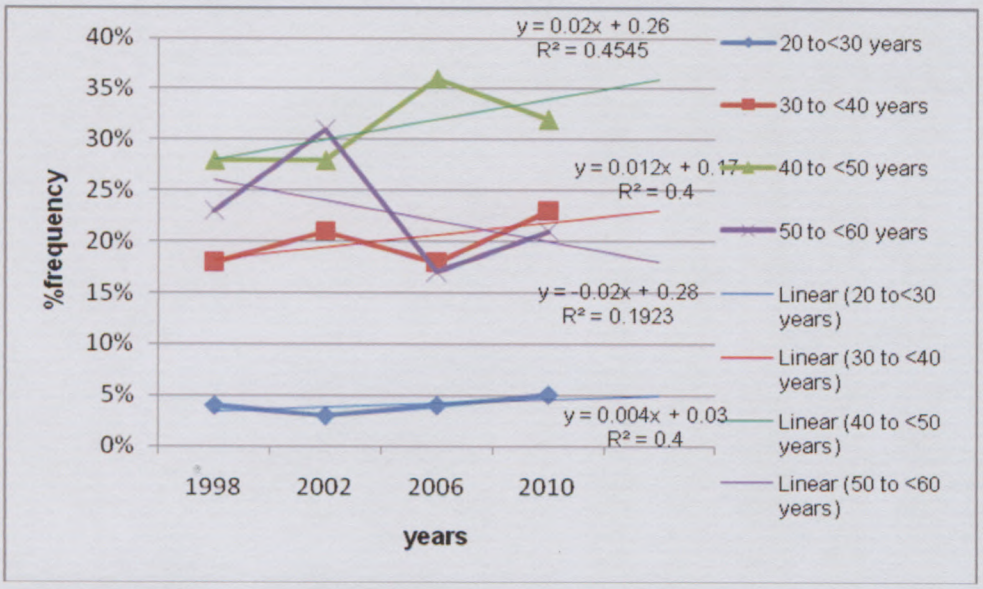

Figure 4.20:Age of patients (20 to < 60 years)

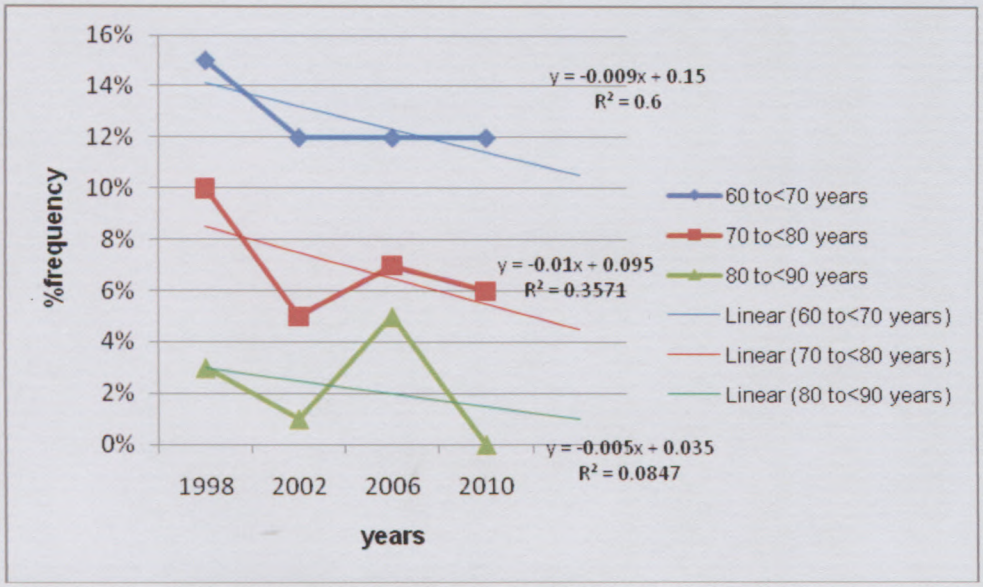

Figure 4.21: Age of patients (60 to < 90 years)

The general appearance of the trend lines demonstrate an upward trend for all the young aged group of patients of ages (20 to < 30 years), (30 to < 40 years) and (40 to < 50 years) and a downward trend for the remainder of the age groups (50 to < 60 years), (60 to < 70 years), (70 to < 80 years) and (80 years to < 90 years). However the gradients of the linear trend lines were not significant {0.004 for (20 to < 30 years), 0.12 for (30 to <40 years), 0.02 for (40 to < 50 years), -0.02 for (50 to < 60 years), - 0.009 for (60 to < 70 years), - 0.01 for (70 to < 80 years) and -0.005 for (80 to < 90 years)} The R^2 value for the trend line (80 to < 90 years) was insignificant (0.084).

4.6 Human immunodeficiency virus status

A multiple bar chart was drawn (figure 4.22) to show the distribution of invasive CaCx patients in terms of recorded and unrecorded HIV status. A line graph (figure 4.23) was also drawn to show the trend of the distribution of patients with recorded HIV status in order to compare the trend of the percentage frequency of HIV positive patients and HIV negative patients.

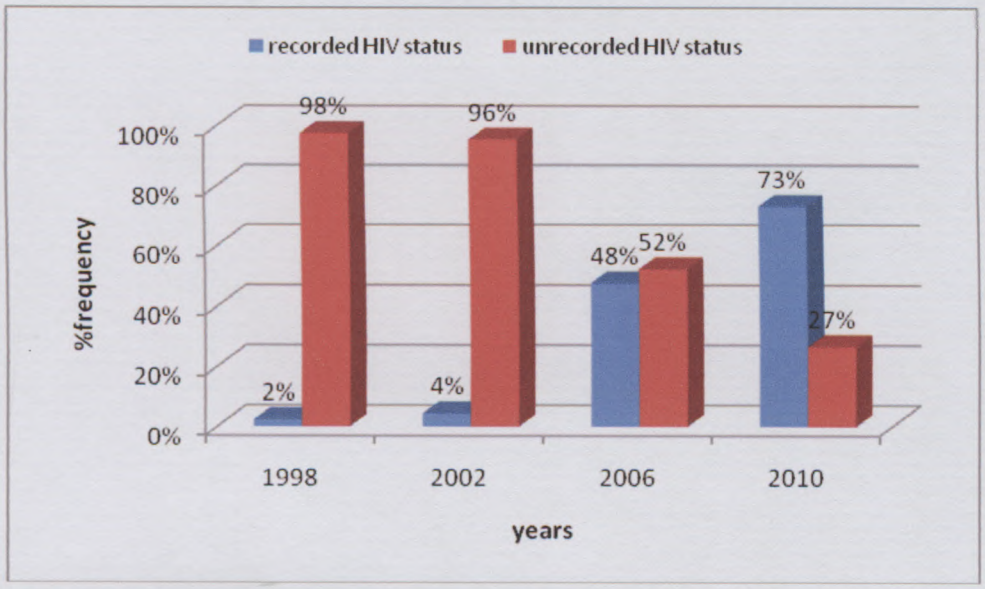

Figure 4.22 Unrecorded and recorded HIV status

In figure 4.22, the percentage frequency of patients with recorded HIV status was negligable for the years 1998 and 2002 with the following percentage frequencies 2% and 4% respectively. The majority of the patients in these two years had unrecorded HIV status, 98% for 1998 and 96% for 2002. In 2006 the percentage frequency of patients with recorded HIV status was 48% and those with unkown or unrecorded status constituted 52%. In 2010 73% constituted patients with recorded HIV status and 27% were those with unrecorded HIV status. It must be emphasised that for the years 1998 and 2002, the sample size for those patients with known or recorded HIV status is 4% and below. Thus the sample of patients with a recorded HIV status is very small for those two sample years and this data cannot be used to show a trend. However the sample size of patients with a recorded HIV status is more significant/ larger for 2006 and 2010 and thus can be used to show a trend.

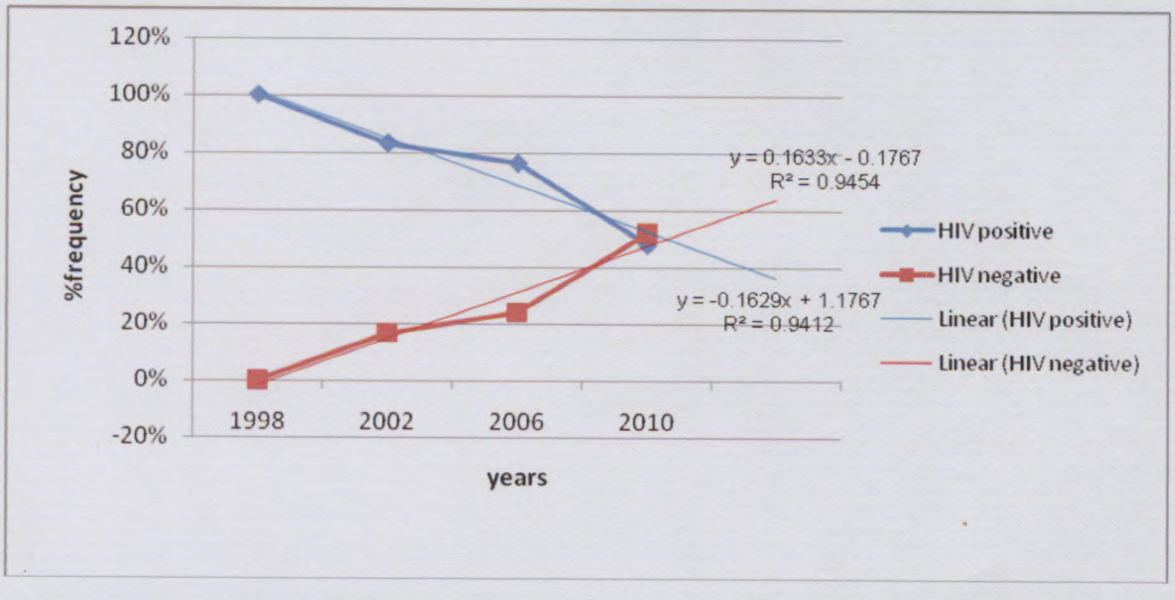

Figure 4.23: Comparison of the proportion of HIV (+ve) and HIV (–ve) patients

The general appearance of the line graph shows that the percentage frequency of HIV positive patients was decreasing and that of HIV negative patients was increasing. The gradient of the trend line for the HIV positive percentage frequency line was -0.1633 and the R^2 value was 0.9454.

The HIV negative percentage frequency trend line had a gradient of 0.1629 and an R^2 value of 0.9412. This indicated trend in both the distribution of HIV positive and HIV negative patients. From 1998 to 2002 the proportion of patients with recorded HIV status was negligible as shown in figure 4.22. However in 2006 76% of the patients' files with recorded status indicated that the patients were HIV positive and 24% were HIV negative. In 2010 a higher percentage frequency of patients' files with recorded HIV negative status (52%) was noted as compared to those with recorded HIV positive status (48%)

4.7 Socio-economic status

Three categories were used to describe socio-economic status of patients where those who were employed and resided in the cities were defined as of a high socio-economic status, those not employed and residing in the city or employed and residing in the rural areas were defined as of a middle socio-economic status and those unemployed and residing in rural areas were defined as belonging to the low socio-economic status group.

Table 4.6 was drawn to show the distribution of patients in terms of socio-economic status and it is noted that the percentage frequency of the number of files with unrecorded status were considered. Pie charts in figures 4.24, 4.25, 4.26 and 4.27 were drawn to show the distribution of patients in terms of socio-economic status for only those patients with recorded information. Figure 4.29 was drawn to show the trend in the distribution of invasive CaCx patients in terms of socio-economic status.

Table 4.6: Socio-economic status (unrecorded status included)

socio-economic status	1998		2002		2006		2010	
	Freq	% freq	Freq	%freq	Freq	%freq	Freq	% freq
High	5	3%	7	5%	14	9%	24	10%
Middle	53	30%	69	50%	42	28%	57	24%
Low	113	64%	57	41%	76	50%	148	62%
Unrecorded	6	3%	5	4%	19	13%	11	5%
Total	177	100%	138	100%	151	100%	240	100%

Table 4.6 shows the distribution of all the patients in the years 1998, 2002, 2006 and 2010 in terms of socio-economic status including those with unrecorded status. The percentage frequency of the files with unrecorded patients' socio-economic status was negligible for all the years except for 2006 where 13% of the patients had unrecorded socio-economic status.

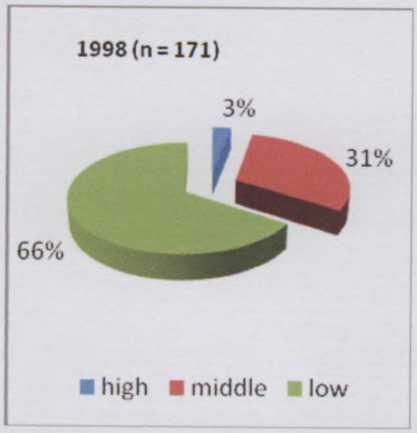

Figure 4.24: Socio-economic status (1998)

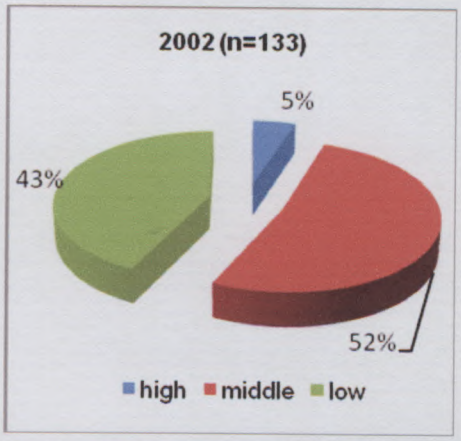

Figure 4.25: Socio-economic status (2002)

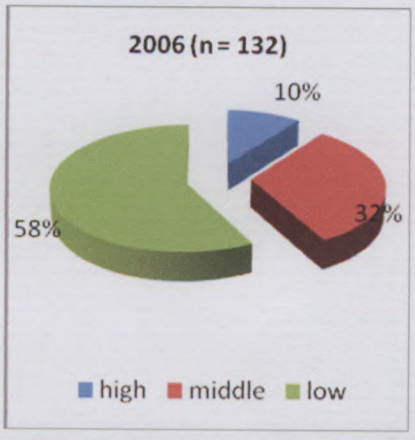

Figure 4.26: Socio-economic status (2006)

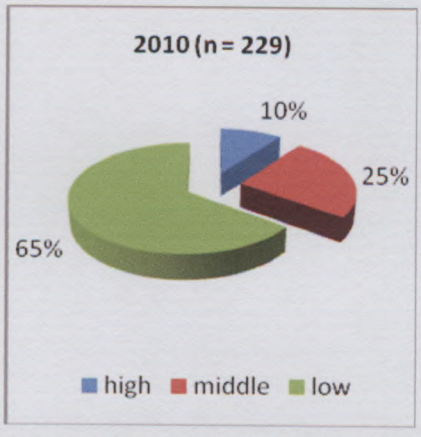

Figure 4.27: Socio-economic status (2010)

In figures 4.24, 4.25, and 4.26 the percentage frequencies of patients who belonged to the low socio-economic status group were the majority with the following percentages 66% for 1998 (figure 4.24), 58% for 2006 (figure 4.26) and 65% for 2010 (figure 4.27). In figure 4.25 (the year 2002) the highest percentage frequency (52%) was recorded for those patients belonging to the middle socio-economic status group. The percentage frequency of patients belonging to the low socio-economic status group for 2002 was 43%. The percentage frequencies for patients in the middle socio-economic status for 1998, 2006 and 2010 were 31%, 32% and 25% respectively. The percentage frequency for the high socio-economic status group for 1998, 2002, 2006 and 2010 were 3%, 5%, 10% and 10% respectively. The average percentage frequency of the low socio-economic status group for 1998, 2002, 2006 and 2010 was 57.25% and that for the

middle socio-economic status group was 34.75% and the high socio-economic status group had an average percentage frequency of 7%.

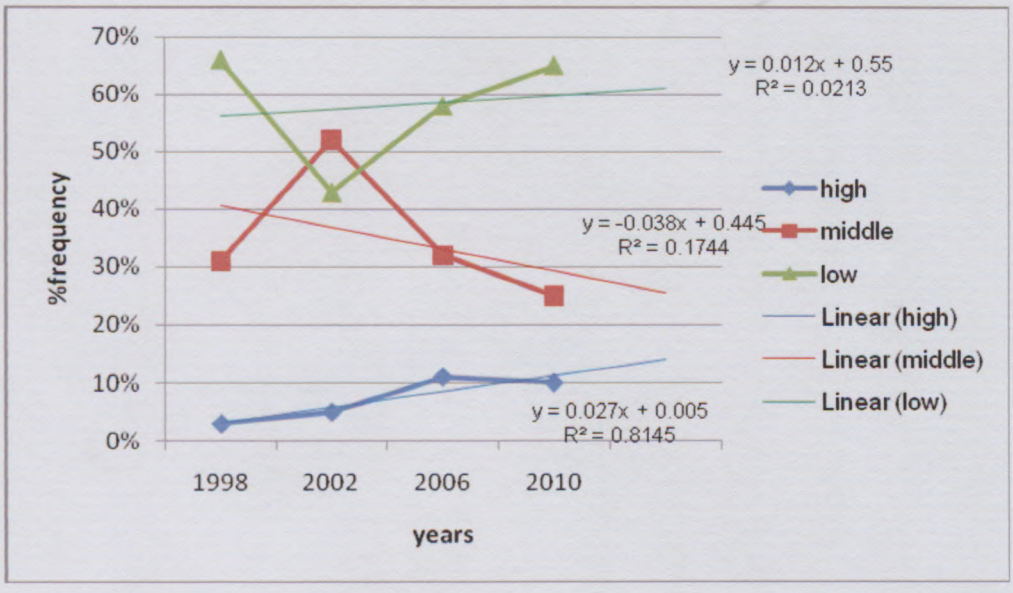

Figure 4.28: Socio-economic status (1998-2010)

The gradients for all the trend lines for high, middle and low socio-economic status groups were insignificant. No significant trend was indicated by the line graph of the percentage frequency for those patients in the low socio- economic status group since its R^2 value was 0.0213.

4.8 Chi square values

Chi square tests were performed using the uniform distribution method to test for the goodness of fit on the distribution of patients in terms of the actual numbers as opposed to proportions. The variables tested were: number of patients registered per year, histology, stage of disease, age of patients, HIV status and socio-economic status of the patients.

4.8.1 Patients registered per year

The Chi square value X^2 was 85.9 and X^2_{crit} was 7.81 at 3 degrees of freedom and probability of 0.05. The p value was 1.66×10^{-18} which is indicative of a significant change.

4.8.2 Histology of the disease

The Chi square test was performed on the distribution of SCC and other histological types.

Chi square value X^2 for SCC was 51.27 and X^2_{crit} value was 7.81 at 3 degrees of freedom and probability of 0.05. The p value was 4×10^{-11} indicating a significant change.

Chi square value X^2 for other histology types was 11.12 and the value of X^2_{crit} was 7.81 at 3 degrees of freedom and probability of 0.05. The p value was 0.011 indicating that change was not very significant

4.8.3 Stage of the disease

When performing the Chi square test some stage categories had to be combined because their frequencies were too low to apply the Chi square test. Stage IA and IB category was combined with stage IIA to form one category. Stage III (A+B) was combined with stage IV to form one category. Table 4.7 shows the Chi square values and the p values for the distribution of the different stages of the disease.

Table 4.7: Chi square values for stage of disease

Stage of disease category	X^2 value	X^2crit value	Degrees of freedom	Probability	P value to test for significance	Comment
IA,IB & IIA	3.26	7.81	3	0.05	0.328	No change
IIB	22.3	7.81	3	0.05	2×10^{-6}	Significant change
IIIA	24.1	7.81	3	0.05	2×10^{-5}	Significant change
IIIB	11.38	7.81	3	0.05	9.8×10^{-3}	Significant change
III (A+B) & IV	15.19	7.81	3	0.05	1.66×10^{-3}	Significant Change

4.8.4 Ages of Patients at presentation

The age classes were compressed into three categories as follows:

20 to < 40 years young adults

40 to < 60 years Middle aged

60+ years Old Age

Chi square tests were performed on the distribution of invasive CaCx patients based on the three defined age categories. Table 4.8 shows the Chi square values in terms of age of patients at presentation.

Table 4.8: Chi square values in terms of age of patients

Age Class (years)	X^2 value	X^2crit value	Degrees of Freedom	Probability	P value to test for significance	Comment
20 to < 40	5.56	7.81	3	0.05	0.13	No change
40 to 60	12.38	7.81	3	0.05	6.2×10^{-3}	Significant change
60+	26.74	7.81	3	0.05	6.67×10^{-6}	Significant change

4.8.5 Human immunodeficiency virus status

For the years 1998 and 2002 the number of files with recorded HIV status was insignificant therefore the Chi square test was performed on the distribution of invasive CaCx patients on only two years 2006 and 2010 which resulted in the degrees of freedom being changed from 3 to 1.

The Chi square value X^2 for HIV positive patients was 6.43 and the X^2_{crit} was 3.84 with 1 degree of freedom and probability of 0.05. The p value was 0.01 indicating that the change was significant.

Chi square value X^2 for HIV negative patients was 50.7 and X^2_{crit} value was 3.84 with 1 degree of freedom and probability of 0.05. The p value was 1.07×10^{-12} indicating a significant change.

4.8.6 Socio-economic Status

The socio-economic status of the patients was categorised into three categories of high, middle and low socio-economic status. Chi square tests were performed to evaluate whether there was any change in the distribution of patients in terms of each of the categories. All the Chi square values are listed in table 4.9.

Table 4.9: Chi square values in terms of socio-economic status

Socio-economic Status category	X^2 value	X^2_{crit} value	Degrees of freedom	Probability	P value to test for significance	Comment
High	17.6	7.81	3	0.05	5×10^{-4}	Significant change
Middle	6.75	7.81	3	0.05	0.08	No change
Low	34.93	7.81	3	0.05	1.26×10^{-7}	Significant change

4.9 Correlation Analysis

Correlation analysis was done using the variable combinations in table 3.3 of chapter 3. Pearson product correlation analysis was used to analyse the association between the variables. In cases where there were dichotomous variables arbitrary numerical values

were allocated. These numerical values are shown in appendix D. Arbitrary values for all the dichotomous variables are stated in appendix C. Interpretation of the Pearson Product Correlation Coefficient (r) in terms of strength of the association is explained in appendix E. A positive value for r means there is a positive association (y value increases as x value increases) and the negative value for r reflects a negative association (y value decreases as x value increases).

Table 4.10: Correlation analysis of histology and four other variables

	Pearson Product Correlation r			
Variable combination	**histology & stage**	**Histology & age**	**Histology &HIV status**	**Histology & S E S**
1998	0.1	0.01		-0.09
2002	-0.04	-0.01		-0.03
2006	0.08	-0.05	0.01	-0.03
2010	-0.1	0.1	-0.03	0.04

No significant association was noted in the variable combination presented in table 4.10.

Table 4.11: Correlation analysis of stage of disease and three other variables

	Pearson Product Correlation r		
Variable combination	**Stage & Age**	**Stage & HIV Status**	**Stage & SES**
1998	-0.08		-0.13
2002	-0.14		-0.01
2006	0.14	-0.24	-0.12
2010	0.01	0.11	0.03

No significant association was noted in all the variable combinations presented in table 4.11.

Table 4.12: Correlation analysis of age against HIV and socio-economic status

	Pearson Product Correlation r	
Variable combination	**Age and HIV Status**	**Age & SES**
1998		-0.19
2002		-0.08
2006	0.05	-0.3
2010	0.45	-0.2

No significant association was noted in all the variables except for age and HIV in 2010 where there was a low degree of association with a correlation coefficient of 0.45.

Table 4.13: Correlation analysis of HIV status and socioeconomic status

Year	**Pearson product correlation value (r)**
	HIV and SES
2006	-0.01
2010	-0.18

No significant association was noted in the variable combination presented in table 4.13.

4.10 Chapter conclusion

The analysis and presentation of collected data in this chapter was able to give meaning to the raw data such that it could be used to answer the research questions and thus determine relevant and appropriate conclusions to the study. In chapter 5 the results of this chapter will be discussed within the study context and appropriate reviewed literature. The conclusions drawn from the data and discussion, challenges of the study and recommendations for further studies will also be presented.

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

"Discovering something significant, and proving it, is one of the greatest joys that life has to offer" (Hofstee, 2006:223)

5.1 Introduction

The following areas are covered in this chapter: discussion of findings; challenges of the study and limitations; contribution of the study; recommendations; addressing the research questions and areas of further study.

5:2 Discussion of findings

This section links the findings of the study to the research questions and illustrates to what extent the research questions have been answered within the study context. The findings and discussion of each research question is compared to the relevant reviewed literature.

5.2.1 Number of patients registered

The total number of new patients registered with invasive CaCx for the four years was 871. The total number of patients registered per year and the proportion is illustrated in table 4.14.

Table 4.14 Distribution of Patients with CaCx (1998-2010)

1998		2002		2006		2010		Total	
Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
182	21%	172	20%	181	21%	336	39%	871	100%

From 1998 to 2006 the number of patients who registered appeared to be constant and then in 2010 there was a sudden substantial increase. In order to clarify whether the increase in the number of patients registered in 2010 was sudden the number of patients registered for 2007, 2008 and 2009 were considered in figure 4.3. The number of registered patients for 2007, 2008 and 2009 were 189, 174 and 218 respectively. After considering the three consecutive years before 2010 the number of registered patients in 2010 remains markedly increased.

In considering the number of patients registering per year it is important to know the country's population figures because these figures may affect the trend of the number of patients registering per year. The Zimbabwean population figures for 1998, 2002, 2006 and 2010 are shown in table 4.15.

Table 4.15 Population distribution in Zimbabwe

Year	1998	2002	2006	2010
Population	11.7	11.4	12.8	11.7

(Adapted from O index Mundi, nd)

The population figures were not reflective of the abrupt increase in the number of patients who registered in 2010 since the population figures for 2010 were lower than those for 2006 and equivalent to the 1998 figures.

In Zimbabwe some awareness campaigns were carried out by the health professionals from the cancer treatment centres and other cancer support groups as of 2009. Furthermore in 2009 the health professionals exhibited at the major agricultural show in the capital city and have been exhibiting at the international trade fares since then. These public awareness exhibits are aimed at informing the business people and the public that attend these functions of the importance of early diagnosis of cancer. This could have influenced the increase in the number of patients who registered for treatment in 2010.However it is noted that the campaigns did not reach most of the rural people and they did not directly benefit from public awareness education campaigns.

The ZMHCW (2009:30-96) indicated that the health delivery system in Zimbabwe is linked to the socio-economic condition of the country. For the past ten years Zimbabwe has been experiencing economic difficulties which worsened in 2008. This resulted in the closure of some public hospitals and those hospitals that remained functioning were operating at very low capacity. Medical costs in the private hospitals were beyond the reach of most Zimbabweans. As a result most people who required medical attention suffered at home without treatment and some died (ZMHCW 2009). In 2009 with the introduction of multicurrency the situation began to improve and public hospitals which were closed were reopened and certain drugs became available (Nyaira, 2010). In 2010 the situation became more stable and most people who were suffering at their homes with medical conditions began to seek medical treatment (Madzorera, 2011). This situation could have contributed to the sudden increase in the number of patients who registered for treatment with confirmed invasive CaCx diagnosis in 2010.

This was furthermore confirmed by the Association of Health Funders of Zimbabwe (AFHoZ), (2010) who pointed out that the medical insurance bill for 2010 was far much higher than any bill that was recorded for the previous ten years. The association attributed this to the sudden increase in the number of people who started seeking medical treatment in 2010 after the improvement of the health delivery system.

An upward linear trend with a rate of increase of 19.54 was recorded for the number of patients registering per year after incorporating the three years between 2006 and 2010 (figure 4.3.) This is in line with what was reported in sub-Saharan Africa where there is an increase in the number of women being diagnosed with invasive CaCx (Giardi et al., 1989:206-211; Chokunonga et al., 2004). However the Zimbabwean situation is in sharp contrast to what is happening in the developed countries where invasive CaCx is becoming uncommon due to the availability of HPV vaccinations, effective screening and early detection. In Zimbabwe there are no HPV vaccinations available as yet and the screening infrastructure is reported to be sub-optimal (Moyo et al., 1997).

The Chi square test indicated a significant change in the number of patients registering per year with a p value of 1.66×10^{-18}. The change in pattern could be due to the influence of the external factors discussed above; population growth, and awareness campaigns and increased access to health care facilities.

Not all files of the patients who registered with invasive CaCx were available at the study site. The percentages of accessible files for 1998, 2002, 2006 and 2010 were 97%, 80%, 83% and 71% respectively as shown in table 4.1.

The variation in the number of registered patients and available files could be because of the following factors:
The study site is located at a central hospital where there are multiple specialists involved in the management of cancer patients. Thus the patients' files move from one department to the other and in the process they may take lengthy time periods to be returned back to the study centre. In some cases the files may be misplaced in the transfer process. Furthermore in some cases patients going to private practice with their respective doctors at times take their files with them.

The year 1998 had the highest number of available files (97%) because the majority of the patients who registered in 1998 were no longer coming for treatment at the time of this study and therefore there was limited movement of files. The year 2010 had the least percentage (71%) of available files because some of the patients who registered in 2010 were still receiving treatment and their files had a higher chance of being out of the filing cabinets since the files were being moved around more frequently.

5.2.2 Histology of the disease
SCC was found to be the most common histology type in invasive CaCx patients at the study centre with the following percentage frequencies: 95% for 1998; 85% for 2002; 95% for 2006 and 91% for 2010. The year 2002 had the lowest percentage frequency (85%), which could have been caused by the high percentage frequency (25%) of files with unrecorded histology (table 4.3).

The adenocarcinomas had the following percentage frequencies: 12% for 1998; 7% for 2002; 5% for 2006 and 7% for 2010. Other histology types constituted the following percentage frequencies: 1% for 1998; 8% for 2002; 0% for 2006 and 2% for 2010.

The average percentage frequency for SCC over the four years of study was 91.75%, adenocarcinomas constituted 5.5% and the average percentage frequency for the other

types of histology was 2.75%.Therefore it can be concluded that SCC constituted the majority (91.75%) of the invasive CaCx pathology followed by the adenocarcinoma type which constituted 5.5% and finally the other types of histology which constituted 2.75%

The distribution of invasive CaCx patients in terms of histology as noted in this study is in agreement with reports from developing countries where SCC is reported to constitute 90-95% and adenocarcinomas less than 5% (WHO, 2010). Studies carried out in Zimbabwe by Parkin et al. (1994: 537-547) and Chirenje et al. (2000: 264-267) showed that SCC constituted 86% and 91% of all invasive CaCx pathology respectively. The findings of this study are within the same range and SCC constituted an average of 91.75% of all invasive CaCx pathology. Garcia et al. (2007) reported that globally adenocarcinomas constitute about 15% of all invasive CaCx patients. The proportion of adenocarcinomas in Zimbabwe is below these suggested global figures. The difference in proportion (5.5%) of adenocarcinomas in Zimbabwe with the global proportion (15%) could be explained by the fact that the proportion of adenocarcinomas is said to be higher in areas where there is a low CaCx incidence (WHO, 2010). Since Zimbabwe is reported to have a high incidence of CaCx it means that the proportion of adenocarcinomas could be lower than in those countries where the incidence of CaCx is low.

The trend analysis in figure 4.8 shows that there was no significant change in trend on the percentage frequencies of all histological types in Zimbabwe. The Chi square test for the distribution of SCC in terms of actual figures showed a significant change with a p value of 4×10^{-11}. However when performing Chi square test the adenocarcinomas and other types of histology were combined to form one group because their numbers were too low to be tested using the Chi square method. The Chi square values for this group did not show a significant change and had a p value of 0.011.

5.2.3 Stage of disease

In 1998, 2002 and 2006 the majority of the patients {33% for 1998 (figure 4.9), 27% for 2002 (figure 4.10) and 24% for 2006 (figure 4.11)} presented with stage IIIB disease. In 2010 (figure 4.12) the majority of the patients (28%) presented with stage IIB disease and stage IIIB was the 3rd highest with a percentage frequency of 15%. The changes in

pattern where more patients presented with earlier stage of disease in 2010 could be due to the awareness campaigns that started to involve the cancer health professionals in 2009

The average percentage frequencies of all stages of disease over the 4 years studied are as shown in table 4.16.

Table 4.16 Average percentage frequencies of all stages of disease

Disease stage	IA & B	IIA	IIB	IIIA	IIIB	III(A+B)	IV
% frequency	2%	9%	22%	15%	25%	16%	10%

The majority (25%) of the patients presented with stage IIIB disease. The least percentage frequency (2%) was recorded for patients presenting with stages (IA & IB) category. Stage IIB had the second highest percentage frequency of 22%. These findings are in line with reports in sub Saharan Africa where the majority of the patients present with late stage disease (stage IIB and above) (Lomalisa et al., 2000:460-463). From this study 11% of the patients presented with stages IA-IIA disease and 89% presented with stage IIB and above.

The low percentage (11%) of the patients who presented with early stage disease in this study is in the same range as that reported by Kasule et al. (1989:61-64) where 19% of the invasive CaCx patients presented with early stage disease. Tsikai (2009) furthermore reported that there was late presentation of cervical cancer patients with the majority of the patients presenting with stages IIB and III disease in Zimbabwe during the period 2007 to 2008. Another study done in 1998 showed that 80.3% of the invasive CaCx patients in Zimbabwe presented with stage IIB and above (Chirenje et al., 2000:264-267). This is also in agreement with the findings of this study.

No statistically significant change was recorded using trend analysis since all the gradients for the trend lines were below 0.1 (figures 4.14 & 4.15).The Chi square test showed significant changes in stages IIB and IIIA.

This significant change is also reflected in the results for 2010 where the majority of the patients presented with stage IIIB disease for the years 1998, 2002 and 2006 and then in 2010 there was a change and the majority of the patients presented with stage IIB followed by stage IIIA. Thus there was an improvement where invasive CaCx patients were now presenting with slightly lower stages of disease as compared to the other three years. This could be due to the effects of the public awareness campaigns which started in 2009. This is in contrast to findings in Nigeria by Olusegan et al. (2008:1203-1204) where a significant change was noted in terms of stage of disease at presentation and in this case patients were presenting with more advanced disease as compared to the previous ten years.

There was no significant change in stages IIIB and IV. This could have been caused by the contrasting effects of awareness campaigns which resulted in patients presenting with less advanced stage disease and an improved accessibility of health facilities in 2010 which resulted in patients who were staying at home with their disease now presenting with advanced stage disease. Thus no significant change could be noted.

In the early stage invasive CaCx (stages IA, IB & IIA) no change was noted. This could be in line with the reports that in Africa, Zimbabwe included the majority of the patients are presenting with late stage disease from stage IIB and above (Lomalisa et al., 2000:460-463; Tsikai, 2009).

5.2.4 Ages of patients at presentation

The minimum ages of patients presenting with invasive CaCx were in the (20 to < 30 years) age group. The mean ages at presentation for 1998, 2002, 2006 and 2010 were 48.8 years, 51 years, 50 years and 52.5 years respectively.

The modal age groups for 1998, 2002, 2006 and 2010 were the (40 to < 50 years) age group with a percentage frequency of 32% for 1998, the (40 to < 50 years) age group with a percentage frequency of 36% for 2002, the (50 to <60 years) age group with a percentage frequency of 31% for 2006 and the (40 to < 50 years) age group with a percentage frequency of 28% for 2010. These results show that the majority of the patients presented between the ages of 40 and 60 years. This is in keeping with global reports on age distribution of invasive CaCx where the risk of CaCx increases until

around the age of menopause (40-60 years). This is reported to be associated with the natural history of HPV infection and its accompanying carcinogenic mechanisms (Schiffman & Brinton, 1995:1888-1901; Walboomers et al., 1999:12-19).

There is a pattern that is followed by the age histograms in figures 4.16, 4.17, 4.18 and 4.19 where minimum percentage frequencies were recorded in the (20 to <30 years) age groups followed by a sharp increase up to the age group (40 to < 50 years) and then a rapid fall off to the minimum percentage frequencies recorded in the (80 to < 90 years) age groups. This pattern is similar to the patterns reported in Denmark, Netherlands, Norway, Dlovenia and Sweden (Gustafsson et al 1997:159-165.)

The lowest ages at presentation belonged to the (20 to < 30 years) age group and the maximum ages at presentation belonged to the (80 to < 90 years) age group for all the years studied. This was in line with sub Saharan Africa reports where the age range for the incidence of invasive CaCx was from 20 to 80 years (WHO, 2010).

Line graphs in figures 4.20 and 4.21 showed no statistically significant changes in trend because the trend line gradients were all insignificant. The Chi square test on age distribution showed no change in the (20 to < 40 years) age group while significant change was noted in the (40 to < 60 years) age group and the (60 + years) age group. The changes in the ages 40 years and above could have been affected by the changing life expectancy in Zimbabwe of 37.8 years in 1998, 36.5 years in 2002, 39.3 years in 2006 and 47.6 years in 2010 (O index Mundi, nd).

The variation in life expectancy from around 38 years to 48 years could have had an effect on the age groups 40 years and above and less or no effect on age groups below 30 years.

5.2.5 Human immunodeficiency virus status

Figure 4.22 showed the distribution of patients in terms of HIV status and whether the HIV status was recorded or not. In 1998 and 2002 the majority of the patients had unrecorded HIV status (98% for 1998 and 96% for 2002). From 2006 to 2010 the percentage frequencies of the patients with recorded HIV status increased to 48% in

2006 and 73% in 2010.The reason for this incremental increase in the number of patients with known HIV status could have been caused by the increase in the number of patients being initiated on antiretroviral therapy (ART) programme in Zimbabwe. According to the WHO (2005) the number of patients being given ART in Zimbabwe was supposed to be increased to 55 000 by the end of 2005. This caused a number of patients to be tested so that they could benefit from the ART programme which was given for free. Ndlovu (2011) further pointed out that from 2005 it was recommended that all patients presenting to the cancer treatment centre were supposed to be tested for HIV and the results be recorded in the patients' files, thus the number of patients with known HIV status increased.

The line graph in figure 4.23 shows an upward trend for the percentage frequency of HIV negative patients with a gradient of -0.1629 and a downward trend was recorded for the percentage frequency of those patients who are HIV positive with a gradient of -0.163. The R^2 value was 0.9412 for the trend line for HIV negative percentage frequency and 0.9454 for the HIV positive percentage frequency. The pattern of distribution of HIV positive and HIV negative patients could be a reflection of the effect of ART on HIV/AIDS defining malignancies. Since more HIV infected patients were introduced to ART their immune systems were boosted thereby reducing their chances of developing HIV related cancers like invasive CaCx (WHO 2005). The Zimbabwean demographic records indicated that the HIV/AIDS adult prevalence for the years 2006 and 2010 were 24.6 and 15.3 respectively (O Index Mundi, nd). The HIV/AIDS prevalence for 2010 was very low compared to the figure for 2006.

This implied that the number of patients with HIV infection in 2010 should be less than when compared to the number of HIV infected patients in 2006 and this variation was reflected in this study in the number of HIV infected invasive CaCx patients.

The number of recorded HIV status cases in 1998 (2) and 2002 (6) were insignificant for any meaningful analysis and could not be used accurately to show a trend. The Chi square test for the distribution of HIV positive patients for 2006 and 2010 showed an X^2 value of 6.43 where X^2_{crit} was 3.84 at 95% level of significance and a p value of 0.01 indicating a significant change. The distribution of HIV negative patients had an X^2 value of 50.7 and an X^2_{crit} of 3.84 at 95% level of significance and a p value of 1.07×10^{-12} indicating a significant change. This significant change in HIV negative patients could have been caused by the fact that since more HIV positive patients were initiated on

ART (WHO, 2005), this boosted their immune system resulting in the reduction of risk of developing invasive CaCx. Thus more patients presenting with invasive CaCx were now HIV negative.

5.2.6 Socio-economic status

The categories used to define socio-economic status were:

- High socio-economic status: employed and residing in the urban areas.
- Middle socio-economic status: not employed and residing in the urban areas or employed and residing in the rural areas.
- Low socio-economic status: not employed and residing in the rural areas

From the description of the socio-economic status categories there is a possibility of the middle socio-economic level overlapping with either the high or the low socio-economic levels. This possible overlap may create a higher percentage frequency in the middle socio-economic level than which is really reflective of the communities presented by these categories. However the researcher had to come up with categories according to the available patients' records in the Zimbabwean context which is why the social factors by the MHCW (2010: 30-96) were adopted to define socio-economic status.

The findings of this study as illustrated by figures 4.24, 4.26 and 4.27 show that the majority of the patients 66% for 1998, 58% for 2006 and 65% for 2010 respectively belonged to the low socio-economic status level. This is in agreement with what was pointed out by Munoz et al. (2002:1093-1103) where cervical cancer is referred to as the disease of the poor women. A variation was noted in 2002 (figure 4.25) where the majority of the patients 52% belonged to the middle socio-economic status and 43% belonged to the low socio-economic status. The variation in the distribution of patients in terms of socio-economic status in 2002 could have been caused by the possible overlap of middle socio-economic level with either the low or high socioeconomic levels thereby resulting in a higher percentage of the patients belonging to the middle socio-economic level. However the average percentage frequency for the low socio-economic status group for all the four years was 57.25%, the average for the middle socio-economic status group was 34.75% and the high socio-economic status group had an average percentage frequency of 7%. Thus the majority (57.25%) of invasive CaCx patients belonged to the low socioeconomic status group and therefore the group classified as

not employed and residing in rural areas constitute the bulk of the invasive CaCx patients in Zimbabwe. This is in agreement with what was noted by Parkin et al. (2002) where 60% - 75% of the women who develop cervical cancer live in the rural areas.

The line graph in figure 4.28 shows no significant changes in trend. Chi square test showed significant changes in the distribution of patients belonging to the low and high socio-economic status group but no change was noted in the middle socio-economic status group.

The variations noted in the changes in pattern of invasive CaCx as shown by the trend analysis and Chi square test are due to the fact that the Chi square test was performed on actual figures while the trend analysis was performed on the proportion of patients. So a change in the actual numbers may not necessarily mean that there is an equivalent change in the proportion of patients of the same group.

5.2.7 Correlation among variables

In correlation analysis using Pearson Product Correlation the researcher is not trying to carry out a cause and effect analysis. The Pearson Product Correlation is seen as a way of assessing whether there is a linear relationship between any two variables. The strength of the linear relationship is defined in appendix E.

No significant association was noted in the variables tested with the exception of 2010 where there was a low degree of association with a correlation coefficient of 0.45 between age at presentation and HIV status. The association was such that young invasive CaCx patients were associated with presenting with HIV infection. This is in line with what was noted by Maiman (1998:43-49) where women infected by HIV presented with invasive CaCx at younger ages and with more aggressive disease. However in this study no association was noted between HIV status and stage of disease.

5.3 Challenges and Limitations of the study

The major challenges and limitations of the study were the:

1. use of secondary data that was negatively impacted on by the unavailability of patient files and unrecorded important patient information and
2. manual filing system at the study centre.

The unavailability of patient files resulted in the reduction of the sample size which might have compromised the findings of the study. The lowest percentage of available files was 71% which was recorded in 2010. This would have had a negative impact on the findings if only one year was studied. However since the study was done over a sample period of four years the effect of one year having a low percentage of available files was then compensated by the high percentages of available files in the other years (1998 had 97%, 2002 had 80% and 2006 had 83%).

In some files information pertaining to study variables was not recorded. An example of this is in 2002 where it was found that 25% of the patients had no recorded histology. During the study process the researcher made modifications in order to neutralize the effect of the missing data. In the case of the histology type in 2002 average percentage frequencies were calculated for all the years studied instead of just considering the low percentage frequency of 2002 alone. Furthermore only the percentage frequency of the patients with recorded histology was considered in the analysis of the distribution of histology types.

Since this study was a retrospective study historic documents in terms of patient files were used. The data in the patients' files was authentic because it is the data used for patient management although the purpose for gathering that data was for treatment delivery and management. The researcher had to limit the study variables to those variables which were recorded in the patient files in order to come up with a conclusive study.

The study centre is still using the manual filing system and retrieving 706 patient files and looking for the required information in each of the files was a challenge. In some files the data pertaining to the treatment variables was recorded on a paper somewhere within the files. This then meant that the researcher had to read through the patient's notes page by page in order to get the required data. This resulted in the researcher

spending an excessive amount of time on data collection as compared to time spent in the literature review, data analysis and report writing.

5.4 Recommendations

Findings of the study and the reviewed literature motivated the researcher to come up with the following recommendations:

5.4.1 Resource mobilization towards prevention and control of invasive cancer of the cervix

Anorlu (2008) argues that facilities for prevention and treatment of invasive CaCx within the African continent are inadequate and African governments need to start recognizing cancer as a major public health concern which needs mobilization of resources towards its control and management. This calls for the government to put together some funding to be used in the prevention and treatment of invasive CaCx.
Since the Zimbabwean government introduced an AIDS levy in 1999 which is 3% of all taxable income, (WHO, 2005) a non communicable disease levy can also be introduced to cater for the prevention and treatment of cancer.

Cancer support groups have been receiving financial support from nongovernmental organizations and most of this money has been channeled towards treatment and palliative care of invasive CaCx patients and nothing much was done to implement preventive measures (Agatha 2011). However prevention is known to be better than cure. Saraiya et al. (2010:977-986) has reported that invasive CaCx can be prevented through effective screening and HPV vaccinations. It then follows that cancer support groups should concentrate more on lobbying for finances to mobilize resources for HPV vaccinations and effective screening facilities which have been reported to be sub optimal in Zimbabwe (Moyo et al., 1997). Effective screening and HPV vaccinations should be introduced concurrently since the results of HPV vaccinations may take more than twenty years to be noticed whereas the effects of screening are immediate (Nyakabau 2011)

5.4.2 Increasing the level of awareness campaigns

Awareness campaigns and health education on cancer has been done at limited levels in Zimbabwe and in most cases it is only those in the urban areas that benefit resulting in more patients from the low socio-economic group presenting with invasive CaCx at advanced stage as compared to those in the high socio-economic group. Devi et al. (2007:1172-1176) reported a cost effective programme of training health workers on cancer symptoms in Malaysia which reduced late stage presentation from 70% in 1993 to 27% in 1998.

In order to minimize late presentation in Zimbabwe awareness campaigns should be carried out nationwide using cost effective methods. Some of the methods that can be adopted are:

1. Involvement of churches and political groups in cancer awareness campaigns, this will be very effective in Zimbabwe because the majority of the people in Zimbabwe go to church or to some political gatherings.

2. The subject of cancer could be taught at primary schools, high schools and tertiary level education in Zimbabwe because once children are taught they will disseminate the information to the adults at home.

3. The ZMHCW has put in place structures such that there are the village health workers who assist people in their different home stead in the rural areas. These work hand in hand with village heads, chiefs and traditional healers. These structures have concentrated on control and prevention of HIV infection, cholera and malaria.

   If cancer awareness campaigns were also done at this level then the majority of the rural population could be made aware of the early symptoms of invasive CaCx and would be more likely to present earlier for treatment.

5.4.3 Expanding the National Cancer Registry of Zimbabwe

Okobia (2003:89-98) pointed out that the lack of properly functional and well maintained cancer registries in most African countries has made it difficult to carry out studies on invasive CaCx in Africa. It is therefore recommended that the National Cancer Registry of Zimbabwe should incorporate the whole country instead of concentrating on records

in the capital city. Hospitals at every level from district, provincial and central level should at least have a department under the National Cancer Registry so that all the data about cancer patients is captured at every level within the health system. This will reveal the patterns of cancer distribution in Zimbabwe and in turn help in improving control and management of the disease. Furthermore the cancer registry offices should be equipped with up to date equipment for data capturing.

5.5 Contributions of the study.

The contributions of studies on changes of patterns whether in the environment, on people or disease need to take place over a reasonably long time period.
However during this study a number of contributions were experienced at different levels within the health delivery system concerned with the control and management of invasive CaCx.

5.5.1 Contributions to the study centre

After discussing the challenges of locating files with management at the study centre a policy was put in place where every file that is taken away from the filing cabinets is signed out by the responsible person and signed in when it is returned. By adopting this policy the centre now finds it easy to quickly locate patients' files.

Knowledge has been created from the findings of this study and health employees at the study centre are now in a position to inform members of the public on the presentation patterns of invasive CaCx.

5.5.2 Contributions at higher levels within the health delivery system

Ongoing support on the awareness campaigns has been secured by the principal researcher from the office of the health advisor to the president. After discussing the findings of this study with the health advisor, the office of the health advisor now sponsors the cancer treatment referral centre to continue exhibiting at the Agricultural shows in Harare and the national trade fairs.

5.6 Addressing the research questions

In this section the research questions are re-visited and addressed individually.

5.6.1 Firstly, the researcher asked what are the presentation patterns of invasive CaCx among Zimbabwean women presenting to the major referral cancer treatment centre in terms of histology, stage of the disease, age of patients, HIV status and socio-economic status.

The presentation patterns that were discovered were as follows:

The histology of invasive CaCx showed that SCC was the commonest type of histology with an average percentage frequency of 91.75%, adenocarcinoma constituted 5.5% and other histology types constituted 2.75%

Looking at stage of disease it was discovered that the average percentage frequencies of all stages of invasive CaCx were 2% for the stages (IA & IB) category, 9% for stage IIA, 22% for stage IIB, 15% for stage IIIA, 25% for stage IIIB, 16% for stage III(A+B) and 10% for stages IV. The majority (89%) of the patients presented with stages IIB and above and 11% of the patients presented with stages IA to IIA.

The presentation pattern of ages of patients was that the minimum age at presentation for invasive CaCx patients was in the (20 to < 30 years) age group and the maximum age at presentation was in the (80 to < 90 years) age group. The majority of the patients presented with ages between 40 and 60 years.

It was discovered that in terms of HIV status from 1998 to 2002 the percentage frequencies of patients with known HIV status were too low to be of value to the analysis done. However, for the period 2006 to 2010 the percentage frequency of invasive CaCx patients with recorded HIV status increased to 48% in 2006 and then to 73% in 2010. Of those patients with known HIV (55/72) 76% were HIV positive and (17/72) 24% were HIV negative in 2006 and in 2010 (85/176) 48% were HIV positive and (91/176) 56% were HIV negative. On average 57% of the patients were HIV positive and 43% were HIV negative.

The presentation pattern of the socio-economic status of the patient sample studied indicated that the majority (58.25%) of the patients with invasive CaCx belonged to the low socio-economic status group. Those who belonged to the middle socio-economic status group constituted 34.75 % and those in the high socio-economic status constituted 7%.

5.6.2 Secondly, the researcher asked what is the trend in the presentation patterns of invasive CaCx in terms of the study variables?

It was discovered that there was no significant change in trend for most variables except for the percentage frequencies of patients who are HIV positive, which showed a downward trend and those who are HIV negative, which had an upward trend.

5.6.3 Thirdly, the researcher asked are there any correlations that exist among the study variables?

It was discovered that no significant association was noted in all the study variables in all the years except for age of patients and HIV status in 2010 where there was a low degree of association with a correlation coefficient of 0.45. This association indicated that young patients who presented with invasive CaCx were associated with being HIV positive at presentation.

5.6.4 Fourthly, the researcher asked are there any changes in the presentation patterns of invasive CaCx in Zimbabwe?

It was found that using Chi square test, on the actual numbers of patients and not proportions change was noted in all the variables except for the stages IIA and below category, the 20 to < 40 years age group and the middle socio-economic status category.

However in some variable categories such as stage IIIB and stage IV categories, 40 to 60 years age category and HIV positive patients category the change was not significant.

In conclusion it was noted that generally there was significant change in the presentation patterns of invasive CaCx in Zimbabwe and this change was noted in the distribution of the following variable categories;

1. The number of patients who registered per year.
2. Histology of the disease, significant change was noted in both the SCC category and the other histological types category.
3. In terms of the stage of disease significant change was noted in the stage IIB and IIIA categories.
4. For ages of patients significant change was noted in the 60+ years age category.
5. In HIV status significant change was noted in the distribution of HIV negative patients.
6. Significant change in terms of socio-economic status was noted in the low and high socioeconomic status categories.

The changes in presentation patterns noted in Zimbabwe could have been due to the changes in the economical and social environment of the country which is in agreement with what was reported by the ZMHCW (2009:30-96) where there is clear evidence of linkage between the health status of Zimbabwe and its social, physical and economic environment. The changes noted in the number of patients who registered per year clearly demonstrated this linkage in that the changes noted in the number of patients who registered per year during the study period were in line with the changes in the economic environment of Zimbabwe.

On the other hand the noted changes are in line with reports from developing countries where it has been reported that the incidence of cervical cancer in many developing countries continue to rise due to lack of effective screening (Giardi et al., 1989:206-211) which may be why there was change in the number of patients registering per year. However there is an interesting variation that was noted in terms of age at presentation. It has been reported that the presence of HIV infection in CaCx patients has resulted in the presentation of CaCx patients at younger ages as compared to previous years (Clarke & Chetty, 2002:19-24). Gichangi et al. (2003:1963-1968) further reported that HIV positive women under the age of 35 years had higher chances of developing invasive CaCx. This means that there was supposed to be change in the distribution of the 20 to < 40 years age group yet no change was noted in this study. This variation

could be due to the fact that HIV status of patients was not recorded in most patients' files as was noted in the years 1998 and 2002 of this study.

5.7 Areas of Further Study

From the findings of this research it was noted that a high percentage of patients had unrecorded HIV status and the number of those patients with recorded HIV status began to increase half way through the study period. It is recommended that it is therefore important to carry out a study in future on the presentation patterns of invasive CaCx in terms of HIV status of the patients.

Since the findings of this research have indicated that the majority of the patients in Zimbabwe present with late stage disease it is important to carry out a survey on the level of awareness that Zimbabwean women have in terms of prevention, screening, early detection and treatment of invasive CaCx. Furthermore a long term study on the presentation patterns should be carried out to follow up on any changes in presentation patterns of invasive CaCx.

During the study the researcher had challenges in collecting patient data from patients' files because it was difficult to locate where the required data was recorded within the patient's file. It is therefore recommended that a study on the patient data capturing and storage at the cancer referral treatment centre should be done with the hope of coming up with a proposal for an informative patient front sheet where the important patient information is recorded. This may further highlight the importance of introducing computerised patient data storage and development of the suitable software for patient data capturing.

This study investigated changes in presentation patterns in terms of five variables which are histology type, stage of disease, age of the patients, HIV status and socioeconomic status. Further studies in presentation patterns in terms of other variables such as HPV status and race are recommended and could benefit the nation.

5.8 Conclusion.

Studies on presentation patterns may require longer times of study in order to bring out the changes in pattern. In this study the period was reasonably long and a number of

changes and patterns were noted. However it is important that such types of studies be carried out on a continuous basis so that policy makers in the health care sector are well informed about any changes in presentation patterns and can take this into account. This will play a role in ensuring the best management and control of the disease.

Hopefully with continuous effort and commitment in fighting invasive CaCx in the sub-Saharan Africa whose CaCx incidence is reported to be 15 times that of the developed countries (Parkin et al., 2003), the continent may achieve what has been achieved by the developed countries where cervical cancer is no longer a threat to the lives of women at a stage when they are most needed by their families and their nations.

The public should work together with the authorities in the health delivery system to come up with suitable strategies to prevent and control invasive CaCx. Since it has been possible to reduce the adult prevalence of HIV/AIDS in the country (O Index Mundi, nd) the same efforts if directed to cancer can reduce the incidence of CaCx in the country which has been reported to be on the rise by Wabinga et al., (2000:1585-1592), and further the findings of this research has indicated an upward trend in the patients registering with invasive CaCx. However the increase in the number of patients registering with confirmed invasive CaCx per year could be both positive and negative. It could be positive in that more people are becoming aware of the existence of the disease and are now coming forward for treatment or negative in that the incidence of CaCx is on the rise in Zimbabwe.

In conclusion the government of Zimbabwe has to keep up the good work it has started in strengthening the country's cancer support systems to ensure that patients gain access to affordable treatment as was recently reported by Matenga (2011:4) because this will go a long way in saving the lives of many people.

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APPENDICES

APPENDIX A: FIGO STAGING

Stage I

Stage 1 is carcinoma strictly confined to the cervix; extension to the uterine corpus should be disregarded. The diagnosis of both Stages IA1 and IA2 should be based on microscopic examination of removed tissue, preferably a cone, which must include the entire lesion.

- **Stage IA**: Invasive cancer identified only microscopically. Invasion is limited to measured stromal invasion with a maximum depth of 5 mm and no wider than 7 mm.
- **Stage IA1**: Stage IA1: Measured invasion of the stroma no greater than 3 mm in depth and no wider than 7 mm diameter.
- **Stage IA2**: Stage IA2: Measured invasion of stroma greater than 3 mm but no greater than 5 mm in depth and no wider than 7 mm in diameter.
- **Stage IB**: Stage IB: Clinical lesions confined to the cervix or preclinical lesions greater than Stage IA. All gross lesions even with superficial invasion are Stage IB cancers.
- **Stage IB1**: Stage IB1: Clinical lesions no greater than 4 cm in size.
- **Stage IB2**: Stage IB2: Clinical lesions greater than 4 cm in size.

Stage II

Stage 2 is carcinoma that extends beyond the cervix, but does not extend into the pelvic wall. The carcinoma involves the vagina, but not as far as the lower third.

- **Stage IIA**: No obvious parametrial involvement. Involvement of up to the upper two-thirds of the vagina.
- **Stage IIAB**: Obvious parametrial involvement, but not into the pelvic sidewall.

Stage III

Stage III is carcinoma that has extended into the pelvic sidewall. On rectal examination, there is no cancer-free space between the tumour and the pelvic sidewall. The tumour involves the lower third of the vagina. All cases with hydronephrosis or a non-functioning kidney are Stage III cancers.

- **Stage IIIA**: No extension into the pelvic sidewall but involvement of the lower third of the vagina.
- **Stage IIIB**: Extension into the pelvic sidewall or hydronephrosis or non-functioning kidney.

Stage IV

Stage IV is carcinoma that has extended beyond the true pelvis or has clinically involved

the mucosa of the bladder and/or rectum.

- **Stage IVA**: Spread of the tumour into adjacent pelvic organs.
- **Stage IVB**: Spread to distant organs.

Adapted from: Sobin, L. and Wittekind Ch. (2002:155-157)

APPENDIX B: FIVE YEAR SURVIVAL RATES FOR CaCx

Stage	Survival Rates
0	93%
IA	93%
IB	80%
IIA	63%
IIB	58%
IIIA	35%
IIIB	32%
IVA	16%
IVB	15%

Adapted from WHO, (2010.)

APPENDIX C: OBSERVATION CHECKLISTS

APPENDIX C1 OBSERVATION CHECKLIST FOR 1998

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
A001	60	NE	RA	IIA	SCC	
A002	46	NE	RA	IIIB	SCC	+ve
A003	73	NE	CITY	IIIB	SCC	
A004	58	NE	RA	IIIB	SCC	
A005	44	NE	RA	IIB	SCC	
A006	63	NE	CITY	IVA	SCC	
A007	45	NE	CITY	IIIA	SCC	
A008	35	NE	CITY	IIIB	SCC	
A009	52	NE	RA	IIIA +B	SCC	
A010	52	NE	RA	IIIB	SCC	
A011	39	NE	RA	IIIB	SCC	
A012	32	NE	CITY	IIIA + B	SCC	
A013	49	NE	RA	IIIB	SCC	
A014	46	NE	RA	IIIA	SCC	
A015	50	NE	RA	IIIA	SCC	
A016	43	E	CITY	IIIA	SCC	
A017	50	NE	CITY	IIIA + B	SCC	
A018	49	NE	RA	IIIA + B	SCC	+ve
A019	72	NE	RA	IIA	SCC	
A020	36	NE	RA	IIIB	SCC	
A021	48	NE	CITY	IIIA + B	SCC	
A022	65	NE	CITY	IIIA +B	SCC	
A023	77	NE	RA	IIIA + B	SCC	
A024	50	NE	RA	IIIB	SCC	
A025	40	NE	RA	IIA	SCC	
A026	49	E	CITY	IIB	SCC	
A027	31	NE	CITY	IIB	SCC	
A028	42	NE	RA	IIB	SCC	
A029	58		RA	IIA	SCC	
A030	41		RA	IVA	SCC	
A031	33	NE	CITY	IIIB	SCC	
A032	45	NE	RA	IIIB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
A033	40	NE	CITY	IIB	SCC	
A034	37	NE	RA	IIIA + B	SCC	
A035	48	NE	CITY	IIA	SCC	
A036	61	NE	RA	IIIB	SCC	
A037	42	NE	RA	IIIB	SCC	
A038	46	NE	CITY	IIIB	SCC	
A039	28	NE	CITY	IIB	SCC	
A040	61	NE	CITY	IIIB	SCC	
A041	50	NE	RA	IIIB	SCC	
A042	33	NE	CITY	IIIB	SCC	
A043	26	NE	CITY	IIIA + B	Adenocarcinoma	
A044	42	NE	RA	IIB	SCC	
A045	39	NE	RA	IIIB	Adenocarcinoma	
A046	52	NE	RA	IIB	SCC	
A047	52	NE	CITY	IIIA + B	SCC	
A048	24	NE	RA	IIIB	SCC	
A042	33	NE	CITY	IIIB	SCC	
A043	26	NE	CITY	IIIA + B	Adenocarcinoma	
A044	42	NE	RA	IIB	SCC	
A045	39	NE	RA	IIIB	Adenocarcinoma	
A046	52	NE	RA	IIB	SCC	
A047	52	NE	CITY	IIIA + B	SCC	
A048	24	NE	RA	IIIB	SCC	
A049	69	NE	CITY	IIIB	SCC	
A050	28	NE	RA	IIIB	SCC	
A051	35	NE	RA	IIIB	SCC	
A052	45	NE	RA	IIIA + B	SCC	
A053	46	NE	RA	IIIB	SCC	
A054	35	NE	RA	IIIB	SCC	
A055	61	NE	RA	IIIA	SCC	
A056	36	NE	RA	IIB	SCC	
A057	41	NE	RA	IV	SCC	
A058	54	NE	CITY	IIIB	SCC	
A059	45	E		IIB	SCC	
A060	60	NE	RA	IIB	Adenocarcinoma	
A061	60	NE	CITY	IIB	SCC	
A062	37	NE	CITY	IIB	SCC	
A063	56	NE	CITY	IIIB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
A064	40	NE	RA	IIA	SCC	
A065	44	NE	RA	IIIB	SCC	+ve
A066	54	NE	RA	IIB	SCC	
A067	58	NE	RA	IIA	SCC	
A068	63	NE	CITY	IIB	SCC	
A069	46	NE	CITY	IIB	SCC	
A070	52	NE	RA	IIIB	SCC	
A071	22	NE		IIIA	SCC	
A072	45			IIB	SCC	
A073	33	NE	CITY	IIIB	SCC	
A074	45	NE	CITY	IIB	SCC	
A075	34	NE	CITY	IIB	SCC	
A076	44	NE	CITY	IVA vvf	SCC	
A077	40	NE	RA	IIIB	SCC	
A078	70	NE	CITY	IIIA +B	SCC	
A079	69	NE	RA	IIIA	SCC	
A080	73	NE	CITY	IIIB	SCC	
A081	41	NE	CITY	IIIB	SCC	
A082	39	NE	CITY	IIIA + B	SCC	
A083	56	NE	RA	IIA	SCC	
A084	35	NE	CITY	IIIB	SCC	
A085	35	NE	RA	IIIB	SCC	
A086	60	NE	RA	IIB	SCC	
A087	49	NE	RA	IIB	SCC	
A088	29	NE	CITY	IIB	SCC	
A089	65	NE	RA	IIIB	SCC	
A090	51	NE	RA	IIIA + B	Adenocarcinoma	
A091	50	NE	RA	IIB	SCC	
A092	38	E	RA	IIIA	SCC	
A093	32	NE	RA	IIIB	SCC	
A094	40	NE	RA	IIIB	SCC	
A095	40	NE	RA	IIB	SCC	
A096	41	NE	CITY	IIB	SCC	
A097	53	NE	RA	IIB	SCC	
A098	46	NE	CITY	IIB	SCC	
A099	58	NE	CITY	IIA	SCC	
A100	56	NE	RA	IIIB	SCC	
A101	49	NE	RA	IB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
A102	26	NE	RA	IIIA +B	SCC	
A103	56	NE	RA	IIB	SCC	
A104	68	NE	RA	IIIB	SCC	
A105	42	NE	RA	IIB	SCC	
A106	61	NE	RA	IIA	SCC	
A107	55	NE	RA	IIIA	SCC	
A108	56	NE	CITY	IIIB	SCC	
A109	50	E	CITY	IIIB	SCC	
A110	60	NE	RA	IIB	SCC	
A111	33	E	CITY	IIB	SCC	
A112	31	NE	RA	IIIA + B	SCC	
A113	24	E	RA	IIIA	SCC	
A114	78	NE	RA	IIA	SCC	
A115	38	NE	RA	IIB	SCC	
A116	43	NE	RA	IIB	SCC	
A117	56	NE	RA	IIIA	SCC	
A118	72	NE	RA	IIIB	SCC	
A119	40	NE	RA	IIIB	SCC	
A120	45	NE	RA	IIIB	SCC	
A121	32	NE	CITY	IIIA	SCC	
A122	70	NE	RA	IIB	SCC	
A123	70	NE	RA	IIIA + B	SCC	
A124	45	NE	RA	IIB	SCC	
A125	65	NE	RA	IIIA + B	SCC	
A126	42	NE	RA	IIIA + B	SCC	
A127	60	NE	RA	IIIB	SCC	
A128	62	NE	RA	IIB	SCC	
A129	42	NE	RA	IIIB	SCC	
A130	46	NE	RA	IIB	SCC	
A131	38	E	RA	IIIA	SCC	
A132	76	NE	RA	IIA	Adenocarcinoma	
A133	48	NE	CITY	IIA	SCC	
A134	49	NE	CITY	IIIA	SCC	
A135	45	NE	CITY	IIIA	SCC	
A136	65	NE	RA	IIIB	SCC	
A137	55	NE	RA	IIIB	SCC	
A138	30	NE	RA	IIIB	SCC	
A139	49	NE	RA	IIB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
A140	72	NE	RA	IIIB	SCC	
A141	61	NE	RA	IIB	SCC	
A142	37	NE	CITY	IIB	SCC	
A143	77	NE	CITY	IIIA	SCC	
A144	38	NE	CITY	IA	SCC	
A145	58	NE	RA	IIIB	SCC	
A146	50		RA	IIIA + B	SCC	
A147	65	NE	RA	IIA	SCC	
A148	40	NE	RA	IVA	Adenocarcinoma	
A149	46	NE	RA	IIB	SCC	+ve
A150	54	NE	CITY	IVA vvf	SCC	
A151	44	NE	RA	IIIB	SCC	
A152	33	NE	RA	IIIB	SCC	
A153	60	NE	RA	IVA	SCC	
A154	44	NE	RA	IIIB	SCC	
A155	39	NE	RA	IIA	SCC	
A156	53	NE	RA	IIIA + B	SCC	
A157	44	NE	RA	IIIA	SCC	
A158	52	NE	RA	IB	SCC	
A159	64	NE	RA	IIIB	SCC	
A160	54	NE	RA	IIIB	SCC	
A161	50	NE	RA	IIIA + B	SCC	
A162	53	NE	RA	IIIA + B	SCC	
A163	80	NE	RA	IIA	SCC	
A164	53	NE	RA	IIIB	Sarcoma	
A165	38	E	CITY	IIIA	SCC	
A166	42	NE	CITY	IIIB	SCC	
A167	39	NE	RA	IIB	SCC	
A168	50	NE	RA	IIB	SCC	
A169	36	E	RA	IIIA	SCC	
A170	39	NE	RA	IIB	SCC	
A171	53	NE	RA	IIIA	SCC	
A172	62	NE	RA	IIB	SCC	
A173	47	NE	RA	IIIB	SCC	
A174	78	NE	RA	IIB	SCC	
A175	45	NE	CITY	IIIA+ B	SCC	
A176	52	NE	RA	IIB	SCC	
A177	59	NE	RA	IIB	SCC	

APPENDIX C2: OBSERVATION CHECKLIST FOR 2002

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
B001	84	NE	CITY	IIIB	SCC	
B002	64	NE	RA	IIIB	SCC	
B003	38	NE		IIB	SCC	
B004	57	NE	RA	IVA		
B005	39	NE	CITY	IIIA	SCC	
B006	47	NE	CITY		Adenocarcinoma	
B007	54	NE		IIIB		
B008	64	NE	CITY	IIB	SCC	
B009	37	E	CITY	IV		
B010	42	NE	CITY	IIB	SCC	
B012	62	NE	RA	IIIA +B	SCC	
B013	42	NE	CITY	IIIB		
B014	56	NE	CITY	IIB		
B015	71	E	RA			
B016	31	NE	RA	IV+	SCC	
B017	77	NE		IIB		
B018	50	NE	RA	IIIB	SCC	
B019	55	NE	RA	IIIB	SCC	
B020	72	NE	RA			
B021	38	NE	CITY	IIA	SCC	
B022	65	NE	RA	IIIB		
B023	23	NE		IIIB	Malginant small cell carcinoma	
B024	50	NE	RA	IB	SCC	
B025	48	NE	RA	IIB	SCC	
B026	75	NE	CITY	IIIB	SCC	
B027	56	NE	RA	IIB		
B028	45	NE	CITY	IIIA	SCC	
B029	54	NE	CITY	IB	SCC	
B030	50	NE	CITY			
B031	87	NE	CITY		Adenopapillary carcinoma	
B032	34	NE	CITY	IIIB	Adenocarcinoma	+ve
B034	43	NE	CITY	IIB	SCC	
B035	71	NE	CITY	IV	SCC	
B036	43	NE	CITY		SCC	
B037	68	NE	CITY	IIIA +B	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
B038	60	NE	CITY	IIIB		
B039	44	E	CITY	IB	SCC	
B040	85	NE	CITY	IIIA +B	SCC	
B041	46	NE	CITY	IIIA	SCC	
B042	72	NE	RA	IVB	SCC	
B043	37	NE	CITY	IIIA +B	SCC	
B044	60	NE	RA	IIB	SCC	
B045	43	NE	RA	IIIA +B	SCC	
B046	42	NE	CITY	IIA	SCC	
B047	62	NE	RA	IIIB	malignant mixed cell tumour	
B048	45	NE	RA	IIIA +B	SCC	
B049	30	NE	CITY	IIIB	SCC	
B050	36	NE	CITY	IIB	SCC	
B051	30	NE	RA	IIIA	SCC	
B052	40	NE	RA	IVB		
B053	42	NE	RA	IIIB	SCC	
B054	41	NE	CITY	IIA	SCC	
B055	46	NE	RA	IIA		
B056	54	NE	CITY	IIIA	SCC	
B057	87	NE	RA	IIIB		
B058	58	NE	CITY	IIIA	SCC	
B059	56	E	CITY	IIA	Adeno sq Ca	
BO60	49	NE	CITY	IIIB	SCC	
B061	82	NE	CITY	IIIA	SCC	
B062	80	NE	CITY	IV	Adenocarcinoma	
B063	61	NE	CITY	IIIB	SCC	
B064	43	NE	RA	IV	SCC	
B065	48	NE	RA	IIB	Adeno sq Ca	
B066	52	NE	RA		Papillary Ca	
B067	53	NE	RA	IIIB	SCC	
N068	48	NE	CITY	IIA	Adeno sq Ca	
B069	34	NE	CITY		SCC	+ve
B070	52	NE	CITY	IVA	SCC	
B071	53	NE	CITY		SCC	
B072	68	NE	CITY	IIIA +B	SCC	
B073	40	NE	CITY	IIA		
B074	43	NE	CITY	IIIB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
B075	50	NE	CITY	IIIB	SCC	
B076	47	NE	RA	IIIB	Adenocarcinoma	
B078	44	NE	CITY			
B079	51	NE	RA	IIIB	SCC	
B080	29	NE	RA	IV	SCC	
B081	36	NE	RA	IIB	SCC	
B082	48	NE	CITY	IIA	SCC	+ve
B083	82	NE	RA	IIIA +B	SCC	
B084	42	E	CITY	IIB		
B085	34	NE	RA	IIIA	SCC	
B086	47	NE	CITY	IIIA +B	SCC	
B 087	65	NE	RA	IIB	SCC	
B088	67	NE	CITY	IIIA +B	SCC	
B089	32	NE	CITY	IIIA +B	SCC	
B090	42	NE	CITY	IIIA +B	SCC	
B091	54	NE	RA	IIB	SCC	
B092	47	NE	RA	IIIA +B	SCC	
B093	50	NE	CITY	IVA	SCC	
B094	48	NE	CITY	IIIA +B	SCC	
B095	35	NE	CITY	IIIA +B	SCC	
B096	46	NE	RA	IIIB	SCC	
B097	88	NE	CITY	IIIA +B	SCC	
B098	41	NE	CITY	IV	SCC	
B099	53	NE	CITY	IIB		
B100	41	NE	RA	IIB	SCC	
B101	40	E	CITY	IIIB		+ve
B102	60	NE	RA	IIIB		
B103	42	NE	RA	IV		
B104	76	NE	CITY	IIB		
B105	72	NE	RA	IIIB	SCC	
B106	70	NE	RA	IIIA +B	SCC	
B107	36	NE	RA	IIIB	SCC	
B108	46	E	CITY	IIB		
B109	48	NE	RA	IIIB	Adenoid cystic Carcinoma	
B110	39	NE	CITY	IIIB	SCC	
B111	27	NE	RA	IIIA	Adenocarcinoma	
B112	64	NE	RA	IIIB		

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
B113	42	NE	CITY	IIIB	Adenocarcinoma	-ve
B114	63	NE	CITY	IIA	SCC	
B115	44	NE	CITY		SCC	
B116	40	NE	CITY			
B117	47	NE	CITY	IIB	SCC	
B118	73	NE	RA	IVB	SCC	
B119	44	NE	RA	IIB		
B120	40	NE	RA		Adenocarcinoma	
B121	34	NE	RA	IIB	SCC	
B122	31	NE	CITY	IIIA+B	SCC	
B123	61	NE			SCC	
B124	65	NE	RA	IIIB	SCC	
B125	56	NE	CCITY	IVA	SCC	
B126	46	NE	RA	IIB		
B127	55	NE	RA	IIIA+B		
B128	66	NE	RA	IIIB	SCC	
B129	50	NE	RA	IVA	SCC	
B130	41	NE	CITY	IIIA	SCC	
B131	30	NE	RA	IB		
B132	48	NE	RA	IIIA+B		
B133	39	NE	RA	IV	SCC	
B134	57	NE	CITY	IIIA+ B	SCC	
B135	54	NE	CITY			
B136	42	NE	CITY	IIIA+B	SCC	
B137	48	NE	RA	IB	SCC	
B138	70	NE	CITY	IIB	SCC	+ve
B139	31	NE	CITY	IIIA		
B140	33	E	CITY	IIB		
B141	46	NE	CITY	IIIA+B		

APPENDIX C3: OBSERVATION CHECKLIST 2006

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
C001	36	E	CITY	IIIA	SCC	
C002	39	NE	CITY	IIIB	SCC	+ve
C003	42	E	CITY	IIIB	SCC	+ve
C004	53	NE	CITY	IIIA	SCC	
C005	39			IIIA + B	SCC	
C006	42	NE	RA	IVB	SCC	+ve
C007	59	NE	CITY	IIIB	SCC	¯ve
C008	57	NE	CITY	IIA	SCC	¯ve
C009	54			IIIB	SCC	
C010	38	NE	CITY	IIIA +B	Adenocarcinoma	
C011	67	NE	RA	IIIA	SCC	+ve
C012	73	NE	CITY	IIA	SCC	
C013	50	NE	RA	IIIB	SCC	+ve
C014	32	E	CITY	IIIA +B	SCC	
C015	35	NE	CITY	IIIA +B	SCC	¯ve
C016	51	NE	CITY	IIB	SCC	
C017	45	NE	RA	IIIB	SCC	
C018	65		RA	IIIB	SCC	
C019	50		RA	IIA	SCC	
C020	56	NE	CITY	IIIA	SCC	+ve
C021	56	NE	CITY	IIIB	SCC	
C022	60	NE	CITY	IB	SCC	
C023	41	E	CITY	IIIA	SCC	+ve
C024	48		RA	IIIB	SCC	
C025	67	NE	CITY	IIB	SCC	¯ve
C026	48	NE	CITY	IIIA	SCC	+ve
C027	33	E	CITY	IIA	SCC	
C028	34	NE	RA	IIIA +B	SCC	+ve
C029	54	NE	CITY	IIB	SCC	
C030	61	NE	RA	IIIB	SCC	
C031	59	E	CITY	IIIA	SCC	+ve
C032	63	NE	RA	IIIA +B	SCC	
C033	49	NE	RA	IIIA +B	SCC	
C034	23	NE	CITY	IIB	SCC	+ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
C035	38	NE	RA	IIIA	Adenocarcinoma	¯ve
C036	39	NE	CITY	IIIA + B	SCC	+ve
C037	76	NE	RA	IIIA + B	SCC	
C038	27	NE	CITY	IIA	SCC	+ve
C039	60	NE	RA	IIIA	SCC	¯ve
C040	34	NE	CITY	IIIB	SCC	+ve
C041	65	NE	RA	IIA	SCC	
C042	51		RA	IIB	SCC	
C043	69	NE	RA	IIIB	SCC	
C044	47	NE	RA	IIIA	SCC	
C045	37	NE	CITY	IIIA + B	Adenocarcinoma	+ve
C046	38	NE	CITY	IVB	SCC	+ve
C047	56	NE	RA	IIIA	SCC	¯ve
C048	59	NE	CITY	IIA	SCC	+ve
C049	36	NE	RA	IV	SCC	
C050	58	NE	RA	IIA	SCC	
C051	54		RA	IIIB	SCC	
C052	45	NE	CITY	IV	SCC	+ve
C053	34	NE	CITY	IIIA	SCC	+ve
C054	53	NE	RA	IIIB	SCC	
C055	70	NE	RA	IIIB	SCC	+ve
C056	59	NE	RA	IIB	SCC	+ve
C057	43	E	CITY	IIIB	SCC	+ve
C058	55	NE	RA	IIIA	SCC	¯ve
C060	43	NE	RA	IIIA + B	SCC	+ve
C061	46	NE	RA	IIB	SCC	+ve
C062	53	NE	RA	IIIB	Adenocarcinoma	
C063	37	NE	CITY	IIB	SCC	+ve
C064	65	NE	RA	IIIA	SCC	+ve
C065	74	NE	RA	IIIB	SCC	
C066	39	E	CITY	IIIA	SCC	¯ve
C067	54	NE	RA	IIA	SCC	
C068	31	NE	RA	IIIA	SCC	
C069	56	E	CITY	IIIA + B	SCC	
C070	44	NE	RA	IIIB	SCC	+ve
C071	40	E	RA	IIB	SCC	
C072	45		RA	IIIA	SCC	
C073	37	NE	CITY	IIIA + B	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
C074	40	NE	RA	IIB	SCC	
C075	45	NE	RA	IV	SCC	
C076	79	NE	RA	IIB	SCC	
C077	50	NE	RA	IIB	SCC	
C078	46	NE	RA	IV	SCC	+ve
C079	43	NE	RA	IIA	SCC	¯ve
C080	44	E	CITY	IIIA +B	SCC	
C081	57	NE	RA	IIIB	SCC	
C082	47	NE	RA	IVB	SCC	+ve
C083	39	NE	CITY	IIA	SCC	+ve
C084	32	NE	CITY	IIIA	SCC	+ve
C085	31	NE	RA	IIIB	SCC	¯ve
C086	45	NE	RA	IIB	SCC	¯v e
C087	47	NE	RA	IIIB	SCC	¯ve
C088	55	NE	CITY	IIIB	SCC	+ve
C089	30		RA	IIIA	SCC	
C090	49		RA	IIA	SCC	
C091	72		RA	IIA	SCC	
C092	61		RA	IIA	SCC	
C093	37		RA	IIIA	SCC	
C093	77			IIA	SCC	
C094	38			IIIA	SCC	
C095	58			IIA	SCC	
C096	50			IIIA +B	SCC	
C097	54			IIA	SCC	
C098	45	NE	CITY	IIIA	SCC	
C099	57	NE	RA	IIIB	SCC	+ve
C100	83	NE	RA	IVB	SCC	+ve
C101	44	NE	RA	IIIA +B	SCC	+ve
C102	56	NE	RA	IIA	SCC	+ve
C103	38	NE	CITY	IIIA +B	Adenocarcinoma	+ve
C104	60	NE	RA	IIIB	SCC	+ve
C105	55	NE	RA	IIB	SCC	¯ve
C106	43	NE	RA	IIIA	SCC	
C107	62		RA	IIIA + B	SCC	+ve
C108	44		RA	IIA	SCC	
C109	43	NE	CITY	IIB	SCC	+ve
C110	64	NE	RA	IIA	Adenocarcinoma	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
C111	53	NE	RA	IIIA	SCC	+ve
C112	58	NE	RA	IIA	SCC	+ve
C113	47	NE	CITY	IIIB	SCC	+ve
C114	34	E	CITY	IIIA + B	SCC	¯ve
C115	43	E	CITY	IIIA + B	SCC	+ve
C116	53	NE	RA	IV	SCC	
C117	51	E	CITY	IIB	SCC	¯ve
C118	56	NE	CITY	IIIA	SCC	
C119	65	NE	RA	IIB	SCC	+ve
C120	63	NE	CITY	IIIA	SCC	
C121	56	NE	RA	IA	SCC	
C122	53	NE	RA	IIIA	SCC	
C123	52	NE	RA	IIIA +B	SCC	+ve
C124	64	NE	CITY	IIB	SCC	
C125	53	NE	RA	IIIA	SCC	
C126	57	NE	RA	IIIA	SCC	
C127	77	NE	RA	IIB	SCC	
C128	64	NE	RA	IIIB	Adenocarcinoma	+ve
C129	34	NE	RA	IIIA+B	SCC	+ve
C130	51	NE		IIA	SCC	
C131	27	NE	CITY	IIIB	SCC	+ve
C132	46	NE	RA	IIIB	SCC	+ve
C133	49	NE	CITY	IIB	SCC	
C134	31	NE	RA	IIA	SCC	+ve
C135	48	NE	CITY	IIIB	SCC	
C136	58	NE	CITY	IVA (vvf)	SCC	
C137	49	NE	CITY	IIIA+B	SCC	¯ve
C138	53	NE	RA	IIIB	SCC	
C139	42	NE	RA	IIIA+B	SCC	
C140	46	NE	RA	IIIA+B	SCC	+ve
C141	66	NE	RA	IIIB	SCC	
C142	52	NE	RA	IIIA+B	SCC	+ve
C143	38	NE	RA	IIIA	SCC	+ve
C144	66	NE	RA	IVA	SCC	
C145	51	NE	RA	IIIA +B	SCC	
C146	50	NE	RA	IIIB	SCC	
C147	55	NE	RA	IIIB	SCC	

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
C148	36	NE	RA	IIB	SCC	+ve
C149	53	NE	RA	IIIB	SCC	
C150	47	NE	CITY	IIB	SCC	
C151	49	E	CITY	IIIA	SCC	+ve

APPENDIX C4: OBSERVATION CHECKLIST FOR 2010

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D001	64	NE	RA	IIIA+B	SCC	-ve
D002	55	NE	RA	IIIA+B	SCC	-ve
D003	62	E	RA	IIB	SCC	
D004	56	NE	RA	IIIA+B	SCC	+ve
D005	37	NE	CITY	IIA	SCC	-ve
D006	58	NE	CITY	IIB	SCC	
D007	45	NE	CITY	IIA	SCC	+ve
D008	62	NE	RA	IIIB	SCC	
D009	79	NE	RA	IIIA	SCC	
D010	50	NE	RA	IIIB	SCC	+ve
D011	74	NE	RA	IIIA	Adenocarcinoma	
D012	47	NE	CITY	IIIA+B	SCC	+ve
D013	73	E	CITY	IIIA	Adenocarcinoma	-ve
D014	74	NE	CITY	IIA	Adenocarcinoma	
D015	56	NE	RA	IIIB	Adenocarcinoma	
D016	53	NE	CITY	IIIA+B	SCC	+ve
D017	57	NE	RA	IIIA	SCC	+ve
D018	44	NE	RA	IIA	SCC	-ve
D019	42	NE	CITY	IB	SCC	+ve
D020	48	NE	RA	IIIB	Adenocarcinoma	+ve
D021	42	NE	RA	IIIA	SCC	+ve
D022	61	NE	RA	IVA	Adenocarcinoma	
D023	54	NE	RA	IIB	SCC	-ve
D024	45	NE	CITY	IIIA+ B	SCC	+ve
D025	45	E		IVA (vvf)	SCC	
D026	58	E	CITY	IIIA+B	SCC	-ve
D027	73			IVA	SCC	
D028	40	NE	RA	IIIA+B	SCC	-ve
D029	45	E	CITY	IIIB	SCC	+ve
D030	52	NE	CITY	IIB	SCC	+ve
D031	49	NE	RA	IIA	SCC	-ve
D032	54	NE	RA	IVA	SCC	-ve
D033	39	E	CITY	IIA	SCC	-ve
D034	42	NE	RA	IVA (vvf)	SCC	+ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D035	49			IIIA+B	SCC	
D036	30	NE	RA	IIIB	SCC	-ve
d037	62	NE	RA	IIIB	Adenocarcinoma	
d038	80	NE	RA	IIIA	Adenocarcinoma	-ve
d039	55	NE	CITY	IIIB	SCC	
D040	39	NE	CITY	IB	SCC	-ve
D041	42	NE	RA	IVB	SCC	-ve
D042	48	NE	CITY	IVA	SCC	+ve
D043	37			IIIA	SCC	
D044	54			IIIB	SCC	
D045	37	NE	RA	IIB	SCC	-ve
D046	55	NE	RA	IIB	SCC	-ve
D047	61	E	CITY	IIA	SCC	
D048	39	E	CITY	IIIB	SCC	+ve
D049	50	E	CITY	IIIA +B	SCC	+ve
D050	64	NE	RA	IV	SCC	-ve
D051	55	NE	RA	IVB	SCC	
D052	30	NE	CITY	IIIA	SCC	+ve
D053	51	NE	CITY	IVA	SCC	+ve
D054	64	NE	RA	IIIA+B	SCC	
D055	47	NE	RA	IIIB	SCC	-ve
D056	28	NE	CITY	IIIB	SCC	+ve
D057	61	NE	RA	IIA	SCC	
D058	66	NE	RA	IIIA	SCC	-ve
D059	40	NE	RA	IIIB	SCC	+ve
D060	59	NE	RA	IIIA	SCC	+ve
D061	47	NE	RA	IIA	SCC	+ve
D062	79	NE	RA	IIIA	SCC	-ve
D063	79	NE	CITY	IIA	SCC	
D064	43	E	CITY	IIIB	SCC	+ve
D065	59	NE	CITY	IIB	SCC	
D066	53	NE	CITY	IIA	SCC	-ve
D067	33	NE	RA	IIB	SCC	
D068	46	NE	RA	IIIA+B	SCC	-ve
D069	35	NE	RA	IIIA+ B	SCC	-ve
D070	30	NE	RA	IVA	SCC	+ve
D071	39	NE	CITY	IIIA	SCC	+ve
D072	43	NE	RA	IIA	SCC	-ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D073	42	NE	CITY	IIIA	SCC	
D074	60			IIIA	SCC	
D075	75	NE	RA	IIIB	SCC	-ve
D076	39	E	CITY	IIIA+ B	SCC	+ve
D077	72	NE	RA	IIB	SCC	-ve
D078	48	NE	RA	IIIA	SCC	
D079	56	NE	RA	IIB	SCC	-ve
D080	46	NE	RA	IIIB	SCC	-ve
D081	70	NE	RA	IIIA+B	SCC	-ve
D082	46	NE	RA	IVA	SCC	+ve
D083	35	NE	RA	IIB	SCC	+ve
D084	50	NE	RA	IIB	SCC	
D085	73	NE	RA	IIB	SCC	-ve
D086	47	NE	CITY	IIIA	SCC	+ve
D087	56	NE	RA	IIIA+ B	SCC	+ve
D088	64	NE	CITY	IIIB	SCC	
D089	46	NE		IVA	SCC	
D090	76	NE	RA	IIB	SCC	-ve
D091	37			IIIA+B	SCC	
D092	81	NE	RA	IIIA	SCC	+ve
D093	37	NE	CITY	IV	SCC	+ve
D094	87	NE	CITY	IIIA+B	Adenocarcinoma	
D095	42	NE	CITY	IIIB	SCC	-ve
D096	37	E	CITY	IIB	SCC	+ve
D097	48	NE		IIIB	SCC	-ve
D098	51	NE	RA	IIA	SCC	+ve
D099	57	NE	RA	IIIA	SCC	-ve
D100	36	NE	RA	IIB	SCC	+ve
D101	75	NE	CITY	IIIA	SCC	-ve
D102	39	NE	RA	IIIB	SCC	+ve
D103	35	NE	RA	IIIA	SCC	+ve
D104	71	NE	RA	IIB	SCC	-ve
D105	48	NE	CITY	IIIA+ B	SCC	+ve
D106	60	NE	CITY	IVA	SCC	+ve
D107	54	E	RA	IIIB	SCC	
D108	57	NE	RA	IVA	SCC	+ve
D109	54	NE	RA	IIIB	SCC	+ve
D110	62	NE	RA	IIB	SCC	-ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D111	40	NE	RA	IIIA	SCC	-ve
D112	66	NE	RA	IVA	SCC	
D113	53		RA	IIIA	SCC	
D114	58	NE	RA	IIIA	SCC	+ve
D115	40	NE	RA	IIIIB	SCC	+ve
D116	49	NE	RA	IIIA	SCC	-ve
D117	33	NE	RA	IIIA+B	SCC	+ve
D118	74	NE	RA	IIIA	SCC	
D119	44	NE	RA	IIIA	SCC	+ve
D120	42	E	CITY	IIB	SCC	¯ve
D121	42	E	CITY	IIIA	SCC	+ve
D122	39	E	CITY	IIIA	SCC	+ve
D123	55	NE	RA	IVA		¯ve
D124	28	NE	CITY	IIIA+B	SCC	+ve
D125	48	NE	RA		SCC	+ve
D126	68	NE	RA	IIB	SCC	
D127	33	NE	RA	IIIA	SCC	+ve
D128	50	NE	RA	IIB	SCC	+ve
D129	51	NE	CITY		SCC	¯ve
D130	49	NE	CITY	IIIA+B	SCC	+ve
D131	68	NE	RA	IIIA+B	SCC	
D132	28	NE	CITY	IIIB	SCC	+ve
D133	49	E	CITY	IIB	Adenocarcinoma	¯ve
D134	46	NE	RA	IVA	SCC	+ve
D135	36	NE	RA		SCC	¯ve
D136	39	E	RA	IIB	SCC	+ve
D137	54	NE	CITY	IIB	SCC	¯ve
D138	60	NE	RA	IIIA	SCC	¯ve
D139	75	NE	RA	IIIA	SCC	
D140	62	NE	RA	IIB	SCC	¯ve
D141	84	NE	RA	IVA	SCC	
D142	72	NE	RA	IIIA+B	SCC	
D143	33	NE	RA	IIB	SCC	+ve
D144	51	NE	RA	IIIA	SCC	¯ve
D145	40	NE	RA	IIB	Adenocarcinoma	+ve
D146	39	NE	CITY	IIIA		+ve
D147	42	NE	CITY	IIIB	SCC	¯ve
D148	56	NE	RA	IIB	SCC	¯ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D149	49	E	CITY	IVA	SCC	¯ve
D150	68	NE	RA	IIIA	SCC	¯ve
D151	54	NE	RA	IIIA+B	Adenocarcinoma	¯ve
D152	60	NE	RA	IVA	SCC	¯ve
D153	88	NE	RA	IIB	Adenocarcinoma	
D154	49	E	RA	IIB	SCC	+ve
D155	41	NE	RA	IVB	SCC	¯ve
D156	57	NE	CITY	IVA	SCC	¯ve
D157	60	NE	RA	IIIB	SCC	+ve
D158	38	NE	RA	IIIB	SCC	+ve
D159	67	NE	RA	IIB	SCC	
D160	41	E	RA	IIB	SCC	¯ve
D161	76	NE	RA	IB	SCC	¯ve
D162	79	NE	RA	IV	SCC	
D163	49	E	CITY	IIB	SCC	¯ve
D164	60	E	CITY	IB	SCC	¯ve
D165	39	NE	RA		SCC	
D166	30	NE	RA	IV	SCC	+ve
D167	55	NE	RA	IIIA+B	SCC	¯ve
D168	74	NE	RA	IIIB	SCC	
D169	48	NE	CITY	IIB	SCC	
D170	54	NE	RA	IIIA +B	SCC	¯ve
D171	68	NE	CITY			
D172	63	E	RA	IIA	Adenocarcinoma	¯ve
D173	47	NE	RA	IIIA	Adenocarcinoma	¯ve
D174	52	NE	RA	IIB	SCC	¯ve
D175	66	NE	RA	IIB	SCC	¯ve
D176	70	NE	RA	IIA	SCC	¯ve
D177	66	NE	RA	IVA	SCC	
D178	83	NE	RA	IIIA+B	SCC	¯ve
F179	38	NE	RA	IIIB	SCC	+ve
D180	31	NE	RA	IIIA	SCC	+ve
D181	53	NE	RA	IIB	SCC	+ve
D182	60	NE	RA	IIA	SCC	¯ve
D183	67	NE	RA	IIIA	SCC	¯ve
D184	50	E	RA	IIB	Ciniii	+ve
D185	46	NE	CITY	IIIA+B	SCC	+ve
D186	29	NE	RA		SCC	¯ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D187	42	NE	CITY	IIIA+B	SCC	¯ve
D188	68	NE	RA	IIIB	SCC	¯ve
D189	45	NE	RA	IIB	SCC	+ve
D190	74	NE	RA	IIB	SCC	¯ve
D191	71	NE	RA	IIB	SCC	¯ve
D192	40	NE	CITY	IIIA	Sarcoma	+ve
D193	54	NE	RA	IIIA+ B	SCC	¯ve
D194	67	NE	RA	IIB	SCC	¯ve
D195	69	NE	CITY	IIB	SCC	¯ve
D196	52	NE	RA		SCC	+ve
D197	51	NE	RA	IIIA+B	SCC	+ve
D198	46	E	CITY	IIB	Adenocarcinoma	¯ve
D199	45	E	CITY			
D200	62	NE	RA	IIIB	SCC	
D201	66	NE	RA	IIB	Adenocarcinoma	
D202	70	NE	RA	IIIA+B	SCC	¯ve
D203	53	NE	RA	IVA	SCC	¯ve
D204	40	NE	RA	IIB	SCC	+ve
D205	40	NE	RA	IIB	SCC	+ve
D206	50	E	CITY			
D207	62	E	CITY			
D208	46	NE	RA	IIIB	SCC	+ve
D209	72	NE	RA	IIIB	SCC	
D210	50	NE	CITY		SCC	¯ve
D211	40	NE	CITY	IIIA+B	SCC	+ve
D212	50	NE	RA	IIIA	SCC	¯ve
D213	62	NE	RA	IIIB	SCC	¯ve
D214	44	NE	CITY	IIIB	SCC	
D215	43	E	CITY	IIB	SCC	+ve
D216	53	NE	RA	IB	SCC	+ve
D217	45	NE	RA	IVA		¯ve
D218	50	NE	RA	IIIA	SCC	¯ve
D219	32	NE	RA	IV	SCC	+ve
D220	68	NE	RA	IIIA+B	SCC	
D221	28	E	CITY	IIIA	SCC	+ve
D222	34	NE	CITY			+ve
D223	58	NE	RA	IIIA+B	SCC	¯ve

Patient Code	Age	Employment Status	Residential Area	Stage	Histology	HIV Status
D224	46	NE	RA	IIB	Adenoid cystic Carcinoma	
D225	47	NE	RA	IIB	Adenosquamous Carcinoma	+ve
D226	56	NE	RA	IIB	SCC	¯ve
D227	58	NE	CITY		SCC	+ve
D228	35	NE	CITY	IIB	SCC	+ve
D229	61	NE	RA	IIIA +B	SCC	¯ve
D230	35	NE	RA	IIB	SCC	+ve
D231	60	NE	RA	IIB	SCC	¯ve
D232	48	NE	CITY	IIB	SCC	
D233	62	NE	RA	IIB		
D234	50	E	CITY	IIIA	SCC	+ve
D235	84	E	RA	IIIB	SCC	
D236	75	NE	RA	IIB	SCC	
D237	32	Ne	Ra	IIB	SCC	
D238	42	NE	RA		SCC	
D239	34	NE	RA		SCC	
D240	30	NE	CITY		SCC	

Key: NE --------- Not employed E ---------- Employed
RA --------- Rural Area

APPENDIX D: NUMERICAL VALUES FOR DICHOTOMOUS VARIABLES

Histology

SCC	1;	Adenocarcinoma	2;	Others	3

Stage of Disease

Stage	Numerical Value Assigned
IA and IB	1
IIA	2
IIB	3
IIIA	4
IIIB	5
III (A+B)	6
IV	7

HIV Status

HIV Positive	1	HIV Negative	2

Socio-economic Status

Status	Value
Low Socioeconomic Status	1
Middle Socio-economic Status	2
High Socio-economic Status	3

APPENDIX E: INTERPRETATION OF CORRELATION COEFFICIENT (r)

- 0.00 and 0.25 indicate weak or no association;
- 0.26 and 0.50 indicate a low degree of association;
- 0.51 and 0.75 indicate a moderate to strong association and
- 0.76 and 1.00 indicate a very strong degree of association.

Adapted from Pett, (1997) in Sim J. and Wright C., (2000; 219)

APPENDIX H: LIST OF FORMULAE

Arithmetic mean ungrouped data

$$A = \frac{1}{n} * \sum_{i=1}^{n} x_i$$

A = average (or arithmetic mean)
n = the number of terms (e.g., the number of items or numbers being averaged)
x_1 = the value of each individual item in the list of numbers being averaged

Grouped data

Arithmetic Mean = ΣfX/Σf
where
X = Individual score
f = Frequency

Standard deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu)^2}{n}}$$

$$\sigma = Standard\ Deviation$$

$$\mu = Mean$$

$$n = Number\ of\ Elements\ in\ Set$$

Mode

$M_0 = O_{mo} + c(f_m - f_{m-1})/2f_m - f_{m-1} - f_{m+1}$

Median

$M_e = O_{me} + c[n/2\text{-}f(<)]/f_{me}$

Range

Range = Maximum value – Minimum value

$= X_{max} - X_{min}$

Pearson's coefficient of skewness

Sk_p = 3(mean-median)/standard deviation

Pearson's Correlation Coefficient

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2}\sqrt{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}}.$$

Where: X represents the independent variables
Y represents the dependent variables
N is the number of the independent and dependent variables
$\bar{X}$ is the mean of the independent variables
$\bar{Y}$ is the mean of the dependent variables.

Straight Line equation used in Linear Regression

Y = a +bx where a is the y intercept
b is the gradient of the straight line
y is the dependent variable
x is the independent variable

Chi square test

$$X^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Where

X^2 = Pearson's cumulative test statistic, which asymptotically approaches O_i = an observed frequency;
E_i = an expected (theoretical) frequency;
n = the number of cells in the table.

Formulae adapted from Hilderbrand D., Ott, R.L. & Gray J.B., (2005)