Age Standardized Rate (ASR) and Age Standardized Cancer Ratio (ASCR) of Nasopharyngeal Cancer in Kariadi Central Hospital during 2002 - 2011

RESEARCH STUDY

Presented as the requirement to follow the research study report examination of the student research study S-1 program medical faculty

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(a) This research project is genuine and never been published or presented for any academic purpose in Diponegoro University or other universities.

(b) This research project is my genuine idea, formula, and research, without any help from other party, except advisor and known parties.

(c) In this research project there is not any people's work or opinion which has been written or published, unless there is a clear note explaining that it is written as reference in the report by telling the author's name and its original book title and also written down in the bibliography.

Semarang, August2012

Statement of

Merry Puspita

PREFACE

Praises and thanks to Allah for all helps and permissions so the writer can finish this study even by hard effort and long time. For this chance also the writer wants to say thank you very much for every people who have given their hand to help the writer in the process of writing, they are :

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Finally, the writer realizes that this research project is still far from being perfect. And the writer hopes that The Almighty God would give back all kindness from every person who has helped. Hopefully, this research project can be useful for all of us.

Semarang, August 2012

The Writer

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NPC	:	Nasopharyngeal Carcinoma
WHO	:	World Health Organization
EBV	:	Ebstein-Barr Virus
DNA	:	Deoxyribo Nucleic Acid
ASR	:	Age Standardization Rates
ASCR	:	Age Standardization Cancer Ratio

Age Standardized Rate (ASR) and Age Standardized Cancer Ratio (ASCR) of Nasopharyngeal Cancer in Kariadi Central Hospital during 2002 - 2011

Merry Puspita[1], Awal Prasetyo[2]

ABSTRACT

Background: *Every year in all over the world, the incidence of nasopharyngeal carcinoma increases. In Indonesia, there was no accurate data. To get an accurate result, without using this standardization, it would be unclear if differing mortality rates were due to age, sex or as a result of other factors. This study aimed to know the incidence of NPC in Kariadi Central Hospital during 2002 – 2011, the distribution trend based on age and sex, using the new WHO world standard, Age Standardization Rates (ASR) and Age Standardization Cancer Ratio (ASCR).*

Objectives: *This study aimed to know the incidence of nasopharyngeal cancer in Dr.Kariadi Central Hospital during 2002 – 2011, the distribution trend based on age and sex, by counting the age standardization rates (ASR) and age standardization cancer ratio (ASCR) score.*

Methods: *It was a descriptive retrospective research using secondary data from medical record of patients of nasopharyngeal carcinoma, diagnosed by Anatomic Pathology Laboratory of Kariadi Hospital-Medical Faculty Diponegoro University during January 1st,2002 - December 31st,2011. Data recorded were anatomic pathology diagnose that came from tissue biopsy or surgery, age & sex which were included clearly in medical record. The collected data were analysed by Microsoft Excel and presented descriptively.*

Result: *There was an increase in the number of NPC patients from year 2002 until 2011, which at the beginning there was only 20 patients in 2002 but then increased to 95 in 2011. The highest number of patient is in the range of 45-49 years old with a total of 78 patients. Based on sex, the women ASR is higher than men ASR, the comparison between men ASR and women ASR in year 2002-2011 is 1:1,4*

Conclusion: *The highest number of patient is in the range of 45-49 years old with a total of 78 patients. Based on age, ASR and ASCR are consistently increase, exept in year 2002 and 2003 if it compare with the study before and compare in every year. However, based on sex, this study does not follow the trend. It can be caused by unavailability of data in some groups of age, so that the counting result became inaccurate.*

Keywords: *Nasopharyngeal carcinoma, ASR, ASCR.*

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Nasopharyngeal carcinoma (NPC) is a tumor arising from the epithelial cells that cover the surface and line the nasopharynx.[1] NPC is primarily a tumor of adults with a peak occurrence between 40 and 60 years, although the tumor can occur in children.[2] Three subtypes of NPC are recognized in the World Health Organization (WHO) classification: 1) Squamous cell carcinoma, typically found in the older adult population; 2) non-keratinizing carcinoma; 3) undifferentiated carcinoma.[3] Approximately one third of nasopharyngeal carcinomas of the undifferentiated type are diagnosed in adolescents or young adults.[1] While environmental factors and genetic susceptibility play important roles in NPC pathogenesis, the Epstein–Barr virus in particular has been implicated in the molecular abnormalities leading to NPC.[4] The detection of nuclear antigen associated with Epstein-Barr virus (EBV) and viral DNA in NPC type 2 and 3, has revealed that EBV can infect epithelial cells and is associated with their transformation.[1,5] Smoking, cooking, and working under poor ventilation, the use of nasal oils and balms for nose and throat, and the use of herbal medicines have also been implicated but are in need of further verification.[2,4,6]

The incidence of NPC is low in most part of the world (an age-adjusted incidence of less than 1 per 100,000 people). However, the incidence of the disease is higher in certain population and geographical regions of the world, such as southern Asia. [4,7] In southern parts of China, the Mediterranean basin and Alaska, the incidence of NPC is moderately elevated; an incidence of 2 per million of NPC in China has been reported. [1,6] The annual incidence of NPC in the UK is 0.25 per million (age standardized, age 0–14 years), 0.1 per million at age 0–9 years and 0.8 per million at age 10–14 years. It seems reasonable to assume, on the basis of England and Wales cancer registry data, suggests an incidence of 1 to 2 per million for NPC at age 15–19 years.[1] In other countries, for example in India, the incidence is comparable to that in the UK at 0.9 per million. Furthermore, the younger age peak in the second decade found in India, is also found in the UK. [7,8] NPC is particularly common in the southern Chinese population of Guangdong, Inuit of Alaska, and native Greenlanders.[2,4] Curiously, African children are more commonly affected than Chinese children. There are about 65,000 new cases each year, and about 38,000 deaths. There is a strong male to female ratio of about 2-3:1, irrespective of geographic location. [2]

In Indonesia, there is a rare accurate data and no including of NPC. There is one research about NPC in Indonesia using data from Anatomic Pathology Laboratory of Kariadi Hospital – Medical Faculty Diponegoro University during January 1st,2001-December 31st,2005, and the result were 448 cases (250 men and 198 women) of

head and neck cancers. Based on the cases, the nasopharyngeal cancers (112 cases or 25%) were the highest incidence and followed by lymph nodes neck cancers (111 cases or 25%). Based on age, the highest number of incidence was between 40-49 years old patients (109 cases or 25%) and followed by between 50-49 years old patients (97 cases or 21%). [9]

Standardization, a common approach for controlling confounding in population studies or data from disease registries, is defined to be a weighted average of stratum specific rates. Typically, discussions on the construction of a particular standardized rate regard the strata as fixed, and focus on the considerations that affect the specification of weights. [6] In epidemiology and demography, most rates, such as incidence, prevalence, mortality, are strongly age-dependent, with risks rising or declining with age. In part this is biological (e.g. immunity acquisition), and in part it reflects the hazards of cumulative exposure, as is the case for many forms of cancer. For a variety of purposes, a single age-independent index, representing a set of age-specific rates, may be more appropriate. This is achieved by a process of age standardization or age adjustment, which defines the new WHO World Standard.[10] Age-standardized rates can be used to compare the incidence rates of countries without being affected by the difference in age distributions from country to country. Without using this standardization, it would be unclear if differing mortality rates were due to age or as a result of other factors. [8]

There are two different approaches to standardization, the indirect method and the direct method. Both methods yield a single summary rate that can be useful for comparison purposes but the rate produced by either direct or indirect standardization is hypothetical (artificial) and describes a rate that would have been obtained had the underlying structure been the same as that of the standard population.[11] Indirect standardization results in the calculation of Standardized Mortality / Morbidity Ratios (SMRs). The direct method of standardization age-specific rates from a study population are applied to the population distribution of a standard population to yield the number of events that would have been expected if the study population had the same age distribution as the standard.[5]

The last data about the incidence of NPC in Semarang has been reported by Sarjadi during 1985 – 1989 using ASR and ASCR methods.[12]

Table 1. ASR and ASCR score of NPC period 1985 – 1989.[12]

Year	ASR		ASCR	
	Male	Female	Male	Female
1985	2,92	2,58	6,23	2,97
1986	4,51	1,16	7,15	1,03
1987	7,71	1,91	13,07	2,32
1988	3,72	1,99	7,41	2,04
1989	4,63	1,83	3,08	1,82

This study is aimed to know the incidence of NPC in Kariadi Central Hospital during 2002 – 2011, the distribution trend based on age and sex, using the new WHO world standard, Age Standardization Rates (ASR) and Age Standardization Cancer Ratio (ASCR).

1.2 Reserch Question

How many is the incidence of Nasopharyngeal Cancer in Dr. Kariadi Central Hospital Semarang during 2002 – 2011 ?

1.3 The Aim of the Study

This study is aimed to know the incidence of nasopharyngeal cancer in Dr.Kariadi Central Hospital Semarang during 2002 – 2011, the distribution trend based on age and sex, by counting the age standardization rates (ASR) and age standardization cancer ratio (ASCR) score.

1.4 The Advantages of the Study

The advantages of this study is to give an epidemiological data especially the incidence of nasopharyngeal cancer in Dr. Kariadi Central Hospital Semarang using Age Standardized Rate (ASR) and Age Standardized Cancer Ratio (ASCR) methods during 2002 – 2011.

1.5 Originality

Table 2. Originality

No.	Author	Title	Methods	Result
1.	Onggo Wiliyanto [13]	Insidensi Kanker Kepala Leher Berdasarkan Diagnosis Patologi Anatomi Di RS DR Kariadi Semarang Periode 1 Januari 2001 – 31 Desember 2005	It was descriptive retrospective research using secondary data from medical record of patients of head and neck cancers, diagnosed by Anatomic Pathology Laboratory of Kariadi Hospital-Medical Faculty Diponegoro University during January 1st,2001 - December 31st,2005.	There were 448 cases (250 men and 198 women) of head and neck cancers. Based on the cases, the nasopharyngeal cancers (112 cases or 25%) were the highest incidence and followed by lymphonodes neck cancers (111 cases or 25%). Based on age, the highest number of incidence was between 40-49 years old patients (109 cases or 25%) and

			followed by between 50-49 years old patients (97 cases or 21%).
2.	Andejani AA, Kundapur V, Malaker K. [14]	Age distribution of nasopharyngeal cancer in Saudi Arabia	Data from the National Cancer Registry for KSA during the period 1994 through to 1996 was compared with data from the World Health Organization International Agency for Research on Cancer (ARC) in Singapore, China, Kuwait and Canada	There were 373 diagnosed Saudi patients with NPC with high incidence among the young population, with 42/373 (22 males/ 20 females) patients in the first 20 years of life, showing a sharp increase both in boys and girls until the ages of 12-14 years.

3.	Suárez E Calo WA, Hernández EY, Diaz EC, Figueroa NR, Ortiz AP. [15]	Age-standardized incidence and mortality rates of oral and pharyngeal cancer in Puerto Rico and among Non-Hispanics Whites, Non-Hispanic Blacks, and Hispanics in the USA.	Analysis of the age-standardized rates (per 100,000) was performed using the world standard population (ASR(World)) from 1998–2002.	The incidence ASR(World) for men in PR was constant, in contrast, a decrease was observed among NHW, NHB, and USH men although only USH showed statistical significance. In women the highest increase in incidence and the lowest decrease in mortality was observed in PR. The ratio of the ASR(World) showed that in all racial/ethnic groups, men had approximately 2–4 fold increased incidence and mortality risk of OPC than women.

The differences from the references with this research study are from the period, the scope of place and methods to analyze the data. The scope of place of this study is at Dr. Kariadi Central Hospital Semarang and the period of this study is during 2002 - 2011 . All of the result finding will be analyze using ASR and ASCR methods.

CHAPTER II

LITERATURE REVIEW

2.1 Nasopharyngeal Carcinoma

The most common type of head and neck cancer is nasopharyngeal carcinoma (NPC).[16] NPC is a rare malignancy in most part of the world but much more common in South East Asia, North Africa and Greenland, and it is one of the most confusing, commonly misdiagnosed, and poorly understood disease.[7,18] Frequently, the disease is clinically silent until it invades adjacent structures and produces symptoms.[18] NPC is a tumor arising from the epithelial cells that cover the surface and line the nasopharynx.[1] It is a squamous cell carcinoma that usually develops around the ostium of the Eustachian tube in the lateral wall of the nasopharynx.[4] NPC has a remarkable racial and geographical distribution. In recent decades, it has attracted world-wide attention because of complex interactions of genetic, viral, environmental and dietary factors, which might be associated with the etiology of this disease.[7,14]

It is believed that a number of etiological environmental factors along with genetic / host factors might be responsible for the causation of this cancer as the incidence is confined mainly to some population / ethnic groups or certain

geographical region of the world. Ho *et al.* suggested that at least three etiological factors are ubiquitous Epstein Barr virus (EBV) infection, genetically determined susceptibility, and associated environmental factors are possibly contributing for the high incidence of NPC.[7,19] EBV is nearly always present in NPC, indicating an oncogenic role.[2,14] The evidence includes: raised levels of antibodies, especially IgA, against EBV (most commonly viral capsid antigen and early antigen) in most patients with NPC compared with normal controls and patients with other cancer types; higher titers of IgA antibodies against EBV in patients with large tumor bulk; presence of EBV DNA or RNA in practically all tumor cells; presence of EBV in a clonal episomal form, indicating that the virus has entered the tumor cell before clonal expansion; presence of EBV in the precursor lesion of NPC, but not in the normal nasopharyngeal epithelium.[9,16] The involvement of EBV in NPC was implicated by the elevated anti-EBV antibody titer in patients than in controls.[16,17] Lo *et al*. showed that EBV DNA was detectable in the plasma samples of 96% of patients with non-keratinizing NPC, compared with only 7% in controls.[12] The detection of nuclear antigen associated with EBV and viral DNA in NPC type 2 and 3, has revealed that EBV can infect epithelial cells and is associated with their transformation.[14,20] Consequently, the viral titer can be used to monitor therapy or possibly as a diagnostic tool in the evaluation of patients who present with a metastasis from an unknown primary, and they may predict disease recurrence, suggesting that they may be an independent indicator of prognosis. [2,3,12,21]

In the other side, familial aggregation of nasopharyngeal carcinoma has been widely documented in the Chinese population: more than 5% of the NPC patients have a positive first-degree family history of NPC in high-risk areas such as Hong Kong (7,2%), Yulin (6,0%), and Guangzhou (5,9%). However, these studies were limited in size, and comparison of the risk of NPC between first degree relatives (FDRs) and general populations were not reported yet. The familial clustering of nasopharyngeal carcinomas could be explained by similar environmental exposures within a family such as dietary or specific EBV strains, and / or genetic predispositions. [2,17] Various human leukocyte antigens (HLA), which encode proteins to identify and present foreign antigens, including EBV peptides is also important etiologic or prognostic indicators in NPC. [17] While histocompatibility profiles of HLA-A2, HLA-B17 and HLA-Bw46 show increased risk for developing NPC, there is variable expression depending on whether they occur alone or jointly, further conferring a variable prognosis (B17 is associated with a poor and A2B13 with a good prognosis, respectively). [2]

NPC is the commonest epithelial cancer in adults with a peak occurrence between 40 and 60 years, and there are other likely etiological factors include genetic susceptibility. [2,3,12] Such living and dietary habits might have some role in the etiology of this cancer.[21] Consumption of food (in particular salted fish) containing carcinogenic volatile nitrosamines, and as in children, EBV.[12] Besides salted fish, other preserved foods and condiments have been shown to be related to higher NPC

risk in many regions, including fermented fish sauce, salted shrimp paste, moldy bean curd, and preserved plum, salted duck eggs, salted mustard green, brine fermented radish root, dried fish, fermented bean past, salted soy bean, canned pickled vegetables, salted tuber, salted mustard greens and salted shrimp paste. [14,17] Smoking, cooking, and working under poor ventilation, the use of nasal oils and balms for nose and throat problems, and the use of herbal medicines have also been implicated but are in need of further verification. The people living in ill ventilated houses are inhaling smoke continuously for longer duration compared to those living in well-ventilated houses.[7] Likewise, chemical fumes, dusts, formaldehyde exposure, and radiation have all been implicated in this complicated disorder.[2]

Three subtypes of NPC are recognized in the WHO classification : [3,5]

1) type 1: Squamous cell carcinoma, typically found in the older adult population
2) type 2: non-Keratinizing carcinoma
3) type 3: undifferentiated carcinoma

Most cases in childhood and adolescence are type 3, with a few type 2 cases.[22] In North America, around 25 % of tumor patients have type 1 histology , 12 % have type 2, and 63 % have type 3. The histological distribution in southern Chinese patients is 2 % , 3 %, 95 %, respectively. Type 2 and 3 are associated with elevated Epstein-Barr virus titers. The Cologne modification of the WHO scheme by Krueger and Wustrow includes the degree of lymphoid infiltration. Types 2 and 3 may be

accompanied by an inflammatory infiltrate of lymphocytes, plasma cells, and eosinophils, which are abundant, giving rise to the term lymphoepithelioma.[23] Two histological patterns may occur: Regaud type, with a well-defined collection of epithelial cells surrounded by lymphocytes and connective tissue, and Schmincke type, in which the tumor cells are distributed diffusely and intermingle with the inflammatory cells. Both patterns may be present in the same tumor. [1,3,7]

In NPC, symptoms related to the primary tumor include trismus, pain, otitis media, nasal regurgitation due to paresis of the soft palate, hearing loss and cranial nerve palsies.[3] Most patients present with an asymptomatic cervical mass (typically in the apex of the posterior cervical triangle or in the superior jugular chain of nodes), epistaxis, a blood-tinged postnasal drip.[2] Larger growths may produce nasal obstruction or bleeding and a "nasal twang". It then typically metastases to cervical lymph nodes. Distant metastases may occur in bone, lung, mediastinum and, more rarely, the liver. Cervical lymphadenopathy is the initial presentation in many patients, and the diagnosis of NPC is often made by lymph node biopsy. Metastatic spread may result in bone pain or organ dysfunction. Rarely a paraneoplastic syndrome of osteoarthropathy may occur with widespread disease. [1,3,7] Unfortunately, because of the non-specific nature of the nasal and aural symptoms and the difficulty of making a clinical examination of the nasopharynx, most patients with this disease are diagnosed only when the tumour has reached an advanced stage (stage III and IV).[24]

Endoscopic evaluation of the upper aero digestive tract with gross lesion biopsy and random biopsies of the lateral, superior, and posterior walls of the nasopharynx for patients with a high suspicion of NPC is standard of care.[2] Beside that, there are another diagnostic methods, include clinical evaluation of the size and location of cervical lymph nodes, indirect nasopharyngoscopy to assess the primary tumor, neurological examination of cranial nerves, computed tomography (CT) / Magnetic Resonance Imaging (MRI) scan of the head and neck to below clavicles to assess base of skull erosion, chest radiotherapy (anteroposterior and lateral) to see if NPC has spread to the lungs, bone scintigraphy by Tc-99-diphosphonate to show whether cancer has spread to the bones, full blood count, urea, electrolyte, creatinine, liver function, Ca, PO4, alkaline phosphate, EBV viral capsid antigen and EBV DNA, biopsy of either the lymph nodes or primary tumor for histological examination.[1,3]

The 3 different staging systems for NPC each use a modification of the T (extent of primary tumor in the nasopharynx), N (degree of nodal involvement), and M (presence of metastasis) system. The burden of disease in different stages ranges from small, localized lesions with no affected nodes to large, locally invading tumors with or without metastases. Nodal involvement, often retropharyngeal and frequently massive, is very common due to the rich lymphatic system in the nasopharynx and its drainage pattern. Distant metastasis, most frequently to bone, lung, and liver, may occur and is more common than with other head and neck cancers. [18] The distribution of regional lymph node spread from nasopharyngeal cancer, particularly of the

undifferentiated type, is different than that of other head and neck mucosal cancers and justifies use of a different N classification scheme. In children this does not have a prognostic impact.[3] A CT scan and / or MRI of the nasopharynx are usually required to adequately stage the tumor.[18]

Table 3. The tumor, node, metastasis (TNM) classification of the American Joint Committee on Cancer [3]

Primary Tumor (T)
TX : Primary tumor cannot be assessed
To : No evidence of primary tumor
Tis : Carcinoma *in situ*
T1 : Tumor confined to the nasopharynx
T2 : Tumor extends to soft tissues of oropharynx and/or nasal fossa
T2a : without parapharyngeal extension
T2b : with parapharyngeal extension
T3 : Tumor invades bony structures and/or paranasal sinuses
T4 : Tumor with intracranial extension and/or involvement of cranial nerves, infratemporal fossa, hypopharynx, or orbit, or masticator space

Regional Lymph Nodes (N)
NX : Regional lymph nodes cannot be assessed
No : No regional lymph node metastasis
N1 : Unilateral metastasis in lymph node(s), 6 cm or less in greatest dimension, above the supraclavicular fossa.
N2 : Bilateral metastasis in lymph node (s) 6 cm or less in greatest dimension, above the supraclavicular fossa
N3 : Metastasis in a lymph node(s)
N3a : Greater than 6 cm in dimension
N3b : Extension to the supraclavicular fossa

Distant Metastasis (M)
MX : Distant metastasis cannot be assessed
Mo : No distant metastasis
M1 : Distant metastasis

Table 4. Stage Grouping [9]

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage IIA	T2a	N0	M0
Stage IIB	T1	N1	M0
	T2a	N1	M0
	T2b	N0, N1	M0
Stage III	T1	N2	M0
	T2a, T2b	N2	M0
	T3	N0, N1, N2	M0
Stage IV A	T4	N0, N1, N2	M0
Stage IVB	Any T	N3	M0
Stage IVC	Any T	Any N	M1

Primary treatment for local or limited regional NPC is with radiation therapy. Because of anatomic limitations and the frequency of nodal involvement, surgery is rarely attempted. Chemotherapy may be used in individuals with extensive local–regional involvement or distant metastases. Local recurrences are treated with radiation with or without chemotherapy.[3,18]

2.2 Epidemiology and Incidence

The word “epidemiology” is derived from the Greek words: epi “upon”, demos “people” and logos “study”.[22] Epidemiology originates from Hippocrates’s observation more than 2000 years ago that environmental factors influence the occurrence of disease. However, it was not until the nineteenth century that the distribution of disease in specific human population groups was measured to any large extent. This work marked not only the formal beginnings of epidemiology but also some of its most spectacular achievements.[22,25] Epidemiology is considered the basic science of public health, and with good reason. Epidemiology is: a) a quantitative basic science built on a working knowledge of probability, statistics, and sound research methods; b) a method of causal reasoning based on developing and testing hypotheses pertaining to occurrence and prevention of morbidity and mortality; and c) a tool for public health action to promote and protect the public’s health based on science, causal reasoning, and a dose of practical common sense.[2]

Epidemiology began as an outgrowth of medicine. Many of its earliest practitioners were clinicians who recognized that poor health is often closely related to a patient's environment and that observations and interventions in groups are directly relevant to treatment and prevention of disease in individual persons.[25] Epidemiologists are concerned not only with death, illness and disability, but also with more positive health states and, most importantly, with the means to improve

health. The term “disease” encompasses all unfavorable health changes, including injuries and mental health.[22] So, Epidemiology means the study of disease in relation to populations. Like the clinical findings and pathology, the epidemiology of a disease is an integral part of its basic description. The subject has its special techniques of data collection and interpretation, and its necessary jargon of technical terms.[23,27]

A focus of an epidemiological study is the population defined in geographical or other terms.. A common population used in epidemiology is one selected from a specific area or country at a specific time. This forms the base for defining subgroups with respect to sex, age group or ethnicity. The structures of populations vary between geographical areas and time periods.[23,25]

Table 5. Definition of epidemiology [22]

This broad definition of epidemiology can be further elaborated as follows:

Study includes	surveillance, observation, hypothesis testing, analytic research and experiments.
Distribution refers to analysis of	times, persons, places and classes of people affected.
Determinants include factors that influence health	biological, chemical, physical, social, cultural, economic, genetic and behavioral.
Health-related states and events refers to	diseases, causes of death, behaviors such as use of tobacco, positive health states, reactions to preventive regimes and provision and use of health services.
Specified populations	include those with identifiable characteristics, such as occupational groups.
Application to prevention and control the aims of public health	to promote, protect, and restore health.

The incidence of disease represents the rate of occurrence of new cases arising in a given period in a specified population, while prevalence is the frequency of existing

cases in a defined population at a given point in time. These are fundamentally different ways of measuring occurrence and the relation between incidence and prevalence varies among diseases.[22]

Table 6. Differences between incidence and prevalence [22]

	Incidence	Prevalence
Numerator	Number of new cases of disease during a specified period of time	Number of existing cases of disease at a given point of time
Denominator	Population at risk	Population at risk
Focus	Whether the event is a new case Time of onset of the disease	Presence or absence of a disease Time period is arbitrary; rather a "snapshot" in time
Uses	Expresses the risk of becoming ill The main measure of acute diseases or conditions, but also used for chronic diseases More useful for studies of causation	Estimates the probability of the population being ill at the period of time being studied. Useful in the study of the burden of chronic diseases and implication for health service

NPC has a well defined geographical distribution, primarily affecting individuals from southern China and South East Asia. It has been reported to be prevalent in three widely different populations, viz. Chinese in South East Asia, Arabs in North Africa and Eskimos in the Arctic. It seems there are some significant geographical and ethnic variables within the country, which predispose people for high incidence of NPC. Environmental factors are numerous and appear to have a secondary role, mainly in the promotion of the neoplastic process.[1] Interestingly, as native-born Chinese migrate, the incidence diminishes in successive generations, although still higher than the native population. [16] Chinese born in North America is considerably lower than those born in China. Certain human leukocyte antigen subtypes have been associated with NPC, as they have various genetic polymorphisms. [4,8]

Head and neck cancer was the eighth leading cause of cancer death worldwide in 2000. Approximately 481,100 new cases developed, and 320,000 persons died of this disease, resulting in an average mortality rate of 7.3 and 3.2 *per* 100,000 males and females, respectively, and an average incidence rate of 8.8 and 5.1 *per* 100,000 males and females, respectively. [28] The highest incidence of NPC has long been observed in Hong Kong, where 1 in 40 men develop NPC before the age of 75 years. Age and sex distribution In high-risk groups, NPC incidence rises after the age of 30 years and peaks at 40-60 years, and thereafter declines. The age distribution is similar in males and females, although rates in men are commonly 2-3-fold those observed in women. [9] Another important characteristic of NPC epidemiology is sex distribution.

In most of the studies male preponderance over the female was reported from different parts of the world. Studies from NE region of India also indicate different age peak groups and male preponderance over the female and the ratio was about 3:1.

2.3 Age Standardized Ratio (ASR) and Age Standardized Cancer Ratio (ASCR)

Epidemiologists are always mindful of population diversity. Virtually every large population is heterogeneous in regard to sociodemographic (e.g., age, gender, education, religion), geographic, genetic, occupational, dietary, medical history, and innumerable other personal attributes and environmental factors related to health. A population can be viewed as a composite of diverse subgroups (ultimately, subgroups of size one, i.e., individuals, but epidemiologic measures break down at that point). Any overall measure or statistic reflects the value of that measure for each of the subgroups comprising the population. [29,30]

Age is a major determinant of cancer incidence. The risk of epithelial cancers, which comprise 90% of all cancers worldwide, increases approximately as a fifth power of age.[30] In part this is biological (e.g. immunity acquisition), and in part it reflects the hazards of cumulative exposure, as is the case for many forms of cancer. For many purposes, age-specific comparisons may be the most useful. However, comparisons of crude age-specific rates over time and between populations may be

very misleading if the underlying age composition differs in the populations being compared. Hence, for a variety of purposes, a single age-independent index, representing a set of age-specific rates, may be more appropriate. This is achieved by a process of age standardization or age adjustment. [10,11]

Standardization (and other adjustment procedures) seeks to provide numbers and comparisons that minimize the influence of age and/or other extraneous factors. In direct standardization the stratum-specific rates of study populations are applied to the age distribution of a standard population. Rates can be standardized for two or more variables simultaneously.[5,10]

Standard is chosen should ideally be maintained for a number of years, during which time the age-structure of populations will alter. For this reason, attempting to match a particular standard to current population age structures is insufficient justification for choosing one standard over another. Hence, rather than selecting a standard to match the current age-structure of some population(s), the standard must be chosen to reflect the average age-structure of all populations to be compared over the period of use. [10] Comparisons across populations of the world should preferably be based on an average world population age structure and that average age structure should correspond to the period of likely use of a standard. To facilitate comparisons globally, all age-standardized rates produced by WHO will be made according to the

new WHO World Standard Population. Hopefully, this single standard will be widely adopted for global comparisons. [5,10]

ASCR devised by Tuyns (1968), which is calculated in a manner analogous to direct standardization using a set of standard proportion for all cancer. The standard is shown in Table 7, The ASCR score is the percentage of a given type of cancer in the series of cases. The sum of the ASCR score for all individual sites are 100. The calculation of ASCR does not include those cases of unknown age. The effect is likely to be small unless the proportion of cases from which age is missing is high and varies according to tumor site.[12]

ASCR = Total (nx / Nx) Wx

nx : Number of new nasopharyngeal cancer cases of at age x

Nx : Number of new nasopharyngeal cases at all age

Wx : World standard proportion all cancer at age x

Table 7. Standard Population Distribution (percent)[5]

Age Range*	Percent
0 – 4	8,86
5 – 9	8,69
10 - 14	8,60
15 - 19	8,47
20 - 24	8,22
25 - 29	7,93
30 - 34	7,61
35 - 39	7,15
40 – 44	6,59
45 – 49	6,04
50 – 54	5,37
55 – 59	4,55
60 – 64	3,72
65 – 69	2,96
70 – 74	2,21
75 – 79	1,52
80 – 84	0,91
85 +	0,63

*For purpose of comparison, the WHO standart age group is an aggregate of the age groups 85 – 89. 90 – 94, 95 – 99 and 100 +

ASR has been calculated according to the direct method, using world standard population. ASR includes cases of unknown age at registration. The calculated rate is then multiplied by T/K, where T is the total number of cases of the same type in

persons of the same sex (including cases of unknown age) and K is the number occurring in persons of known age. [12]

ASR = Total (nx / y . px) Wx for 100.000 population

nx : number of new nasopharyngeal cancer cases at age x

y : number of year on which rates are based

Px : number of person in population (who live in Semarang) at age x in the same sex

Wx : world standard population at age x [14]

CHAPTER III

FRAMEWORK, CONCEPT, HYPOTHESIS

3.1 Theoritical Framework

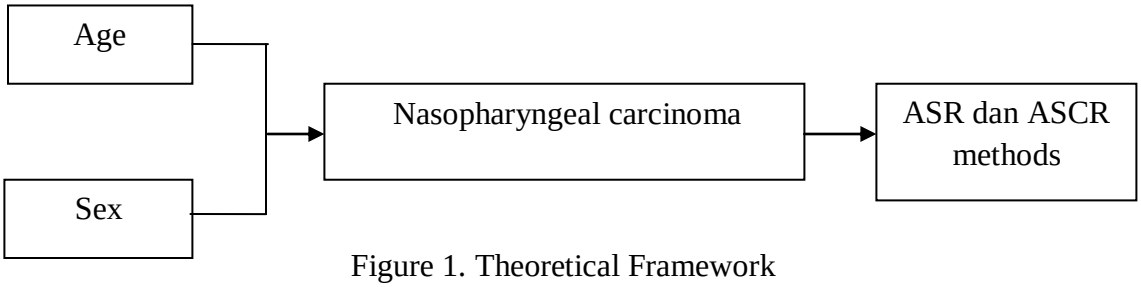


Figure 1. Theoretical Framework

3.2 Conceptual Framework

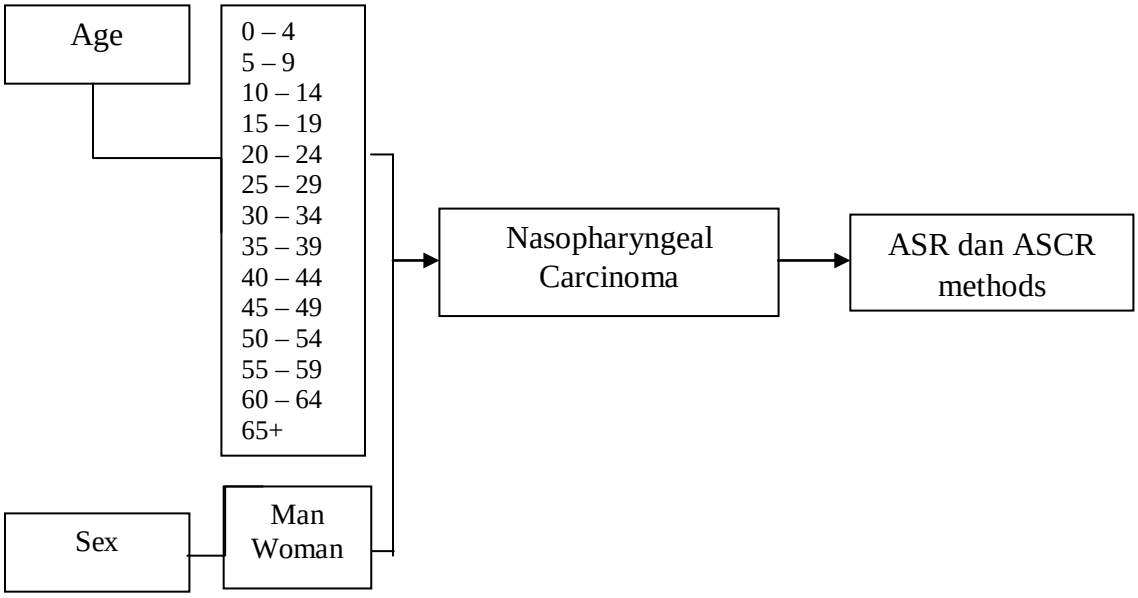


Figure 2. Conceptual Framework

3.3 Hypothesis

ASR & ASCR score of NPC in Dr. Kariadi Center Hospital will increase by year, and the result will compare to previous study. There is different ratio between ASR score for man and woman of NPC incidence in Indonesia.

CHAPTER IV

METHODS

4.1 Study Scope

The scope of medical science consists Anatomical Pathology and Otorhinolaryngology.

4.2 Study time and place

The scope of place for this study is at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University (MFDU) Semarang. The scope of time is between February and June 2012.

4.3 Study types

Based on the purposes, the study design comprised a retrospective descriptive study.

4.4 Population and Sample

4.4.1. Population

The population of this study is taken from medical records of NPC patients between January 1st 2002 and December 31st 2011 based on Anatomical Pathology

diagnoses at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University.

4.4.2. Sample

Samples taken are all of the medical records which diagnose Nasopharyngeal cancer between January 1st 2002 and December 31st 2011 at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University.

4.4.2.1. Inclusion criteria

The total samples were taken purposively and all the included criteria were recorded (all medical record that clearly stated the diagnosis of nasopharyngeal cancer with sex data and address data).

4.4.2.2 Exclusion criteria

They also met the following exclusion criteria i., no histopathogic-data, no complete data (sex and address).

4.5 Operational definition

1) Nasopharyngeal carcinoma (NPC) is a tumor arising from the epithelial cells that cover the surface and line the nasopharynx.[1]

   Scale : Nominal

2) Age is the age of the patients which recorded on medical records and categorized according to the study at the time that clearly diagnose as nasopharyngeal carcinoma patient.

   Scale : Ratio

3) Sex is the sex of the patients which clearly recorded on medical records and categorized according to the study.

   Scale : Nominal

4) ASCR (Age Standardized Cancer Ratio) is calculated in a manner analogous to direct standardization using a set of standard proportion for all cancer.[12]

   Scale : Ratio

5) ASR (Age Standardized Rate) has been calculated according to the direct method, using word standard table.[12]

   Scale : Ratio

4.6 Methods of collecting data

4.6.1 Material of study

The material of this study is the medical records of nasopharyngeal cancer patients between January 1st 2002 and December 31st 2011 based on Anatomical Pathology diagnoses at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University.

4.6.2 Data

Collected data are secondary data from the medical records of nasopharyngeal cancer patients between January 1st 2002 and December 31st 2011 based on Anatomical Pathology diagnoses at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University.

4.7 Plot of study

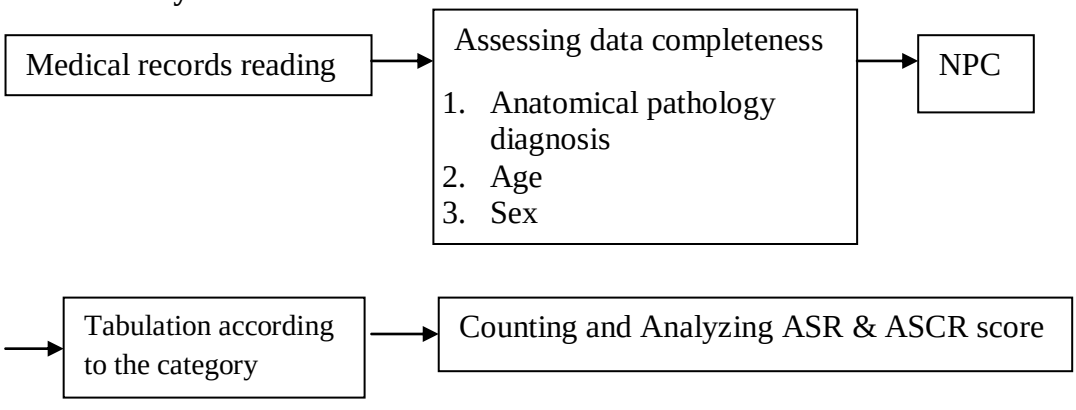


Figure 3. Plot of study

4.8 Sample collection and data analysis

Written data on medical records which match the criteria of each group were being collected and recorded. Collected data entered a manually tabulation process and being analyzed, presented descriptively using Microsoft Excel, analyzed and discused for making a conclusion and suggestion.

4.9 Ethical Clearance

The ethical clearance presented by Ethical Clearance Commission of Medical Faculty – Diponegoro University, after the proposal examination. The name of patients and the private identity of patients are confidential.

4.10 Time table

Schedule	Month											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Deciding the tittle												
Arranging chapter 1												
Arranging of chapter 2												
Arranging of chapter 3												
Arranging of chapter 4												
Proposal examination												
Collecting data												
Analysing data												
Arranging the result												
Result examination												

Figure 4. Time table

CHAPTER V

RESULT

After collected data from the medical records of nasopharyngeal cancer patients between January 1st 2002 and December 31st 2011 based on Anatomical Pathology diagnoses at Anatomical Pathology Laboratory of dr. Kariadi Central Hospital / Medical Faculty of Diponegoro University, the result is :

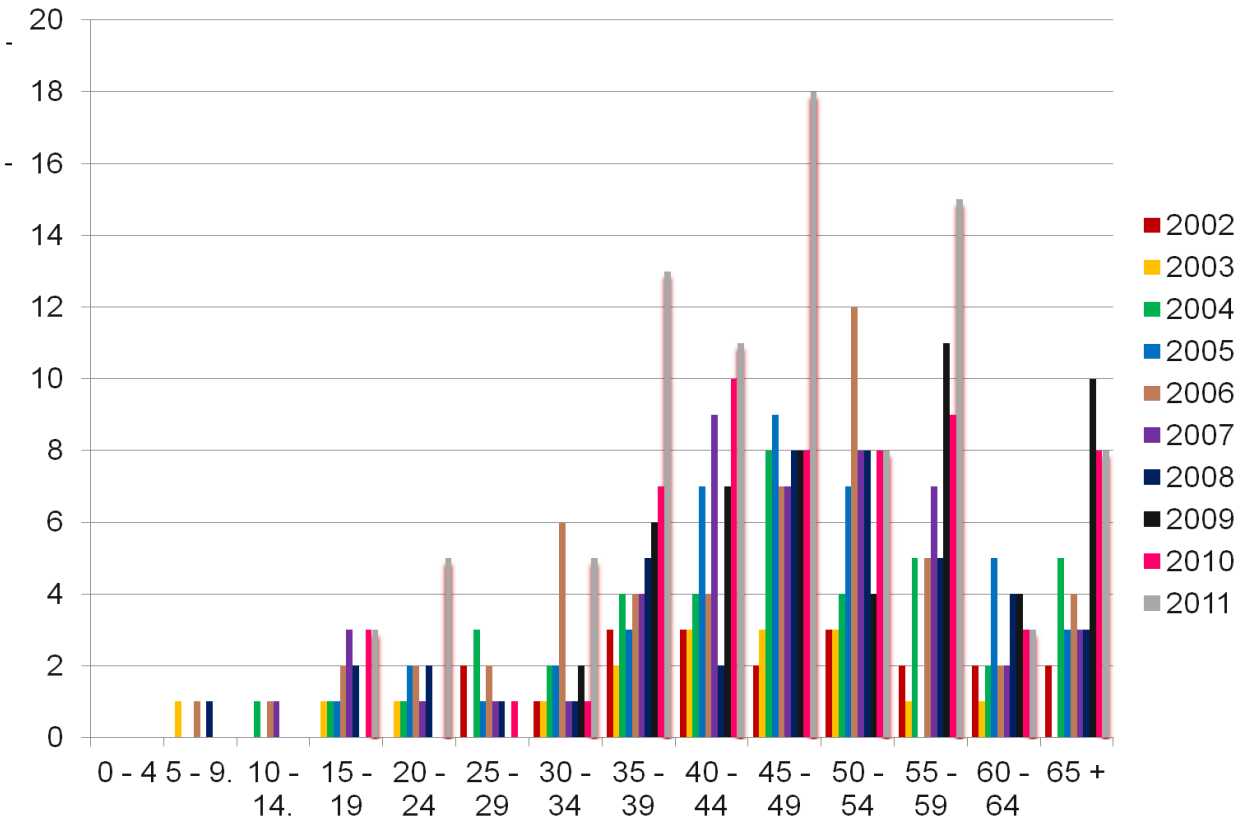


Figure 5 : All of NPC patients based on age

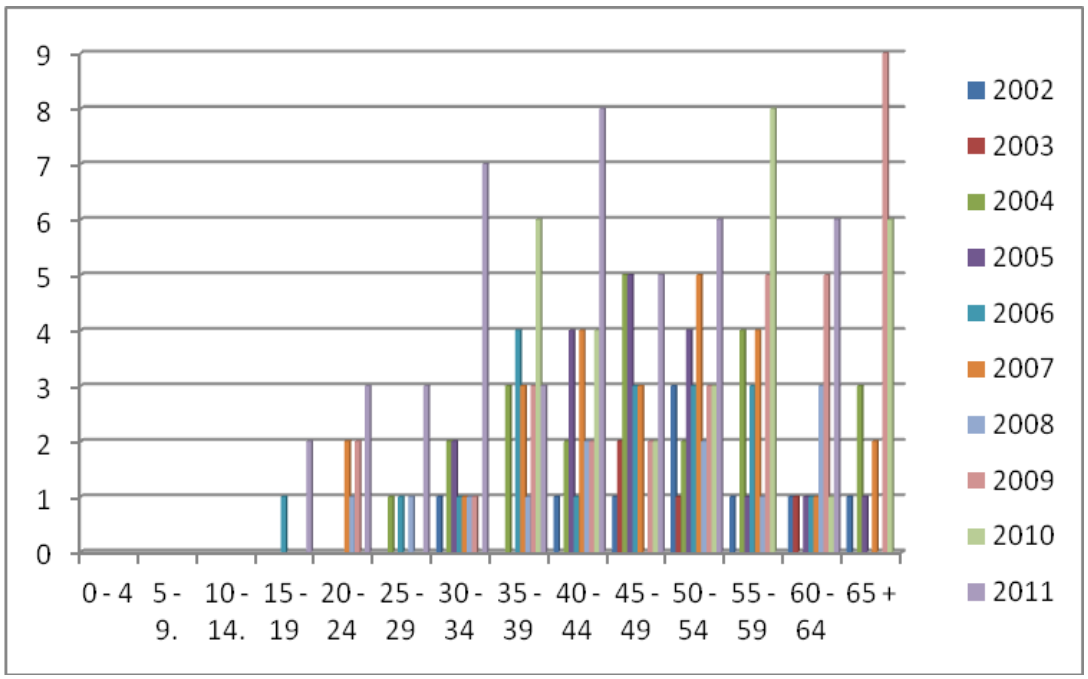


Figure 6 : NPC patients who lived in Semarang based on age

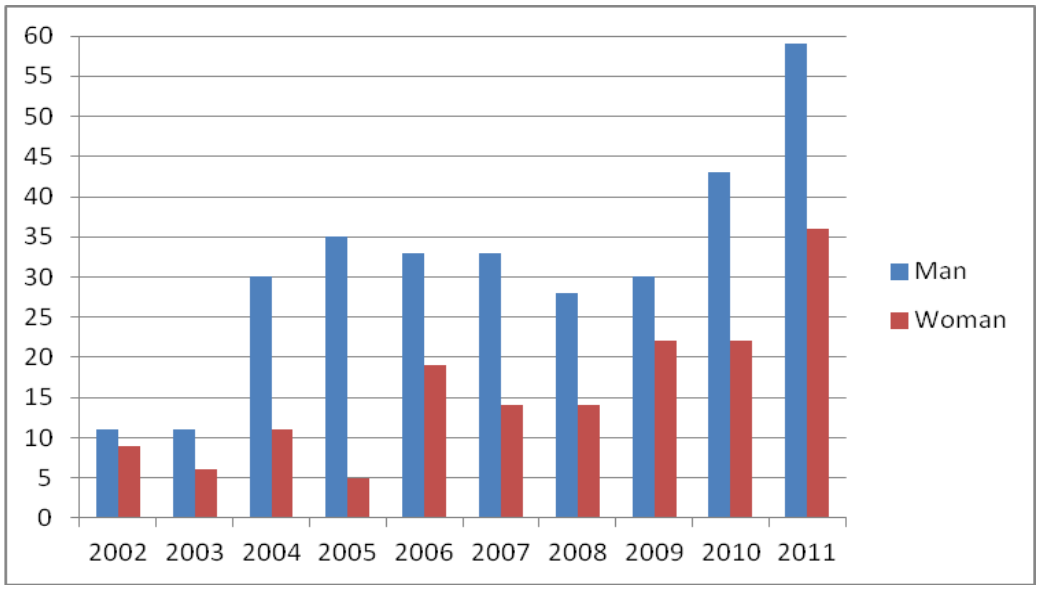
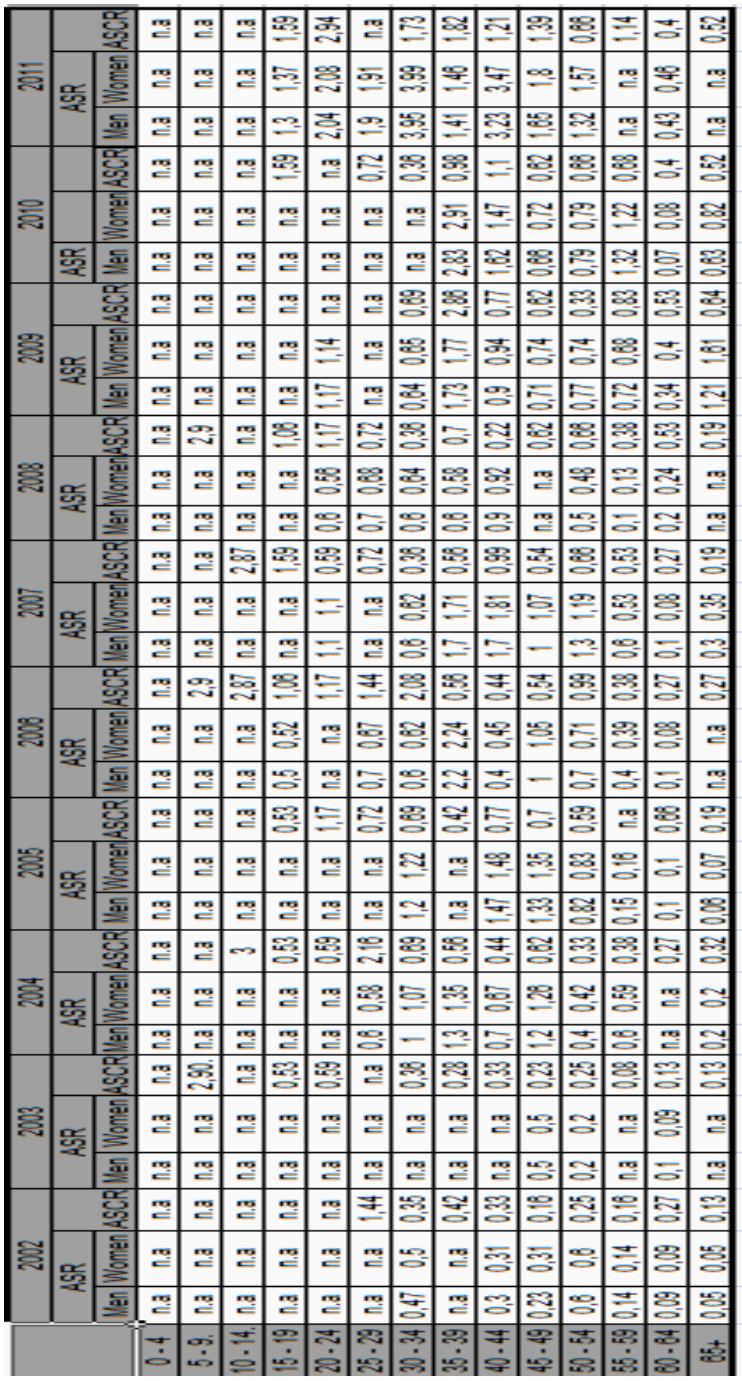


Figure 7 : All of NPC patients based on sex



	2002			2003			2004			2005			2006			2007			2008			2009			2010			2011		
	ASR			ASR			ASR			ASR			ASR			ASR			ASR			ASR			ASR			ASR		
	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR	Men	Women	ASCR
0 - 4	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
5 - 9.	n.a	n.a	n.a	n.a	n.a	2,90.	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	2,9	n.a	n.a	n.a	n.a	n.a	2,9	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
10 - 14.	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	3	n.a	n.a	n.a	n.a	n.a	2,87	n.a	n.a	2,87	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
15 - 19	n.a	n.a	n.a	n.a	n.a	0,53	n.a	n.a	0,53	n.a	n.a	0,53	0,5	0,52	1,06	n.a	n.a	1,59	n.a	n.a	1,06	n.a	n.a	n.a	n.a	n.a	1,59	1,3	1,37	1,59
20 - 24	n.a	n.a	n.a	n.a	n.a	0,59	n.a	n.a	0,59	n.a	n.a	1,17	n.a	n.a	1,17	1,1	1,1	0,59	0,6	0,68	1,17	1,17	1,14	n.a	n.a	n.a	n.a	2,04	2,08	2,94
25 - 29	n.a	n.a	1,44	n.a	n.a	n.a	0,6	0,58	2,16	n.a	n.a	0,72	0,7	0,87	1,44	n.a	n.a	0,72	0,7	0,69	0,72	n.a	n.a	n.a	n.a	n.a	0,72	1,9	1,91	n.a
30 - 34	0,47	0,5	0,35	n.a	n.a	0,38	1	1,07	0,69	1,2	1,22	0,69	0,6	0,82	2,08	0,6	0,62	0,38	0,6	0,64	0,38	0,64	0,65	0,69	n.a	n.a	0,38	3,95	3,99	1,73
35 - 39	n.a	n.a	0,42	n.a	n.a	0,28	1,3	1,35	0,56	n.a	n.a	0,42	2,2	2,24	0,58	1,7	1,71	0,58	0,6	0,58	0,7	1,73	1,77	2,86	2,83	2,91	0,98	1,41	1,46	1,82
40 - 44	0,3	0,31	0,33	n.a	n.a	0,33	0,7	0,67	0,44	1,47	1,48	0,77	0,4	0,45	0,44	1,7	1,81	0,99	0,9	0,92	0,22	0,9	0,94	0,77	1,62	1,47	1,1	3,23	3,47	1,21
45 - 49	0,23	0,31	0,16	0,5	0,5	0,23	1,2	1,28	0,62	1,33	1,35	0,7	1	1,05	0,54	1	1,07	0,54	n.a	n.a	0,62	0,71	0,74	0,82	0,88	0,72	0,82	1,65	1,8	1,39
50 - 54	0,6	0,8	0,25	0,2	0,2	0,25	0,4	0,42	0,33	0,82	0,83	0,59	0,7	0,71	0,99	1,3	1,19	0,68	0,5	0,48	0,68	0,77	0,74	0,33	0,79	0,79	0,68	1,32	1,57	0,68
55 - 59	0,14	0,14	0,16	n.a	n.a	0,08	0,6	0,59	0,38	0,15	0,16	n.a	0,4	0,39	0,38	0,6	0,53	0,53	0,1	0,13	0,38	0,72	0,68	0,83	1,32	1,22	0,68	n.a	n.a	1,14
60 - 64	0,09	0,09	0,27	0,1	0,09	0,13	n.a	n.a	0,27	0,1	0,1	0,68	0,1	0,08	0,27	0,1	0,08	0,27	0,2	0,24	0,53	0,34	0,4	0,53	0,07	0,08	0,4	0,43	0,46	0,4
65+	0,05	0,05	0,13	n.a	n.a	0,13	0,2	0,2	0,32	0,08	0,07	0,19	n.a	n.a	0,27	0,3	0,35	0,19	n.a	n.a	0,19	1,21	1,81	0,84	0,63	0,82	0,52	n.a	n.a	0,52

Figure : ASCR, women ASR , men ASR score from 2002 through to 2011

Figure 8 until 21 shows the line of ASR score for woman, ASR score for man and ASCR score :

These following charts are charts which compare the ASR score development in women, men, and ASCR score from year to year based on age group:

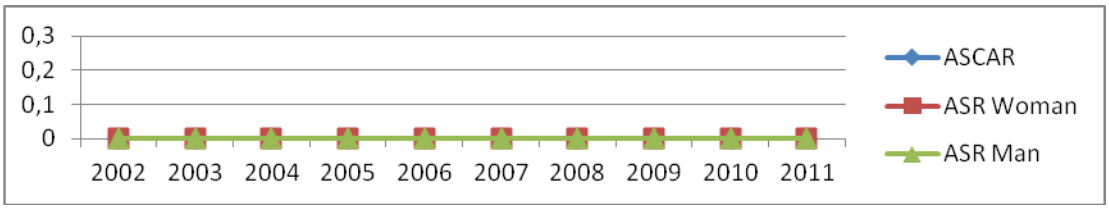


Figure 8 : ASR and ASCR score of NPC patients for 0 – 4 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

Because of unavailable data, researchers can not compare both ASR and ASCR score in 0-4 years old group from year 2002-2011.

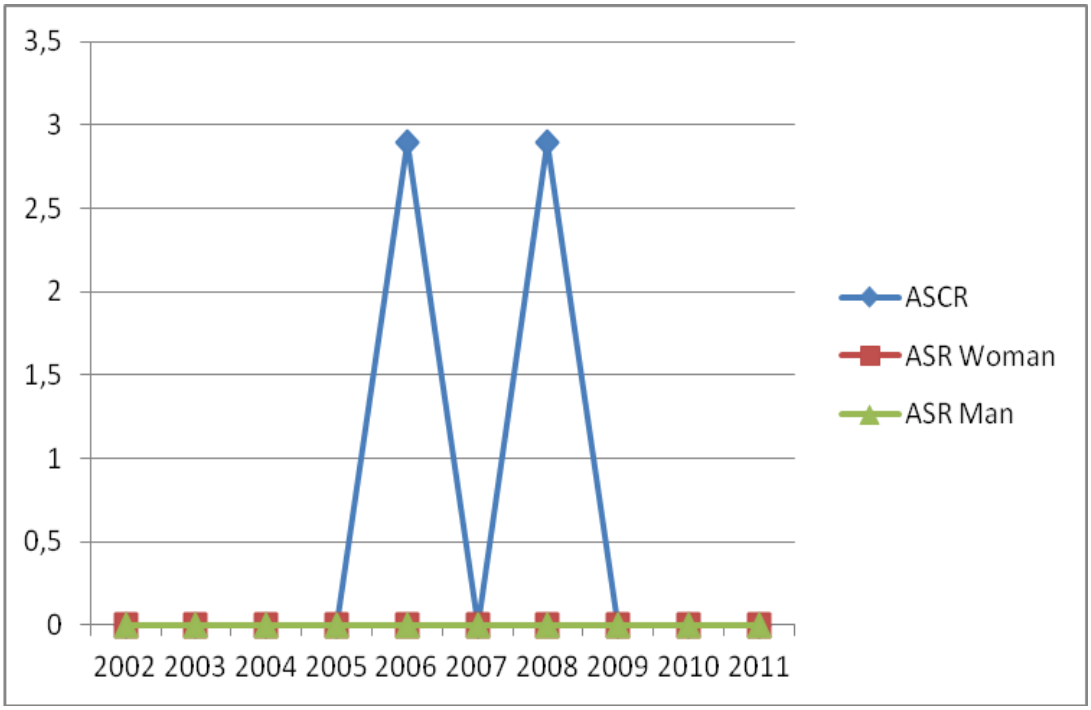


Figure 9 : ASR and ASCR score of NPC patients for 5 – 9 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

Based on the chart above it can be seen that ASCR score is constantly has a same score (2,9) in every year. Because of unavailable data, the researcher can not compare both ASR for man and woman in this age group.

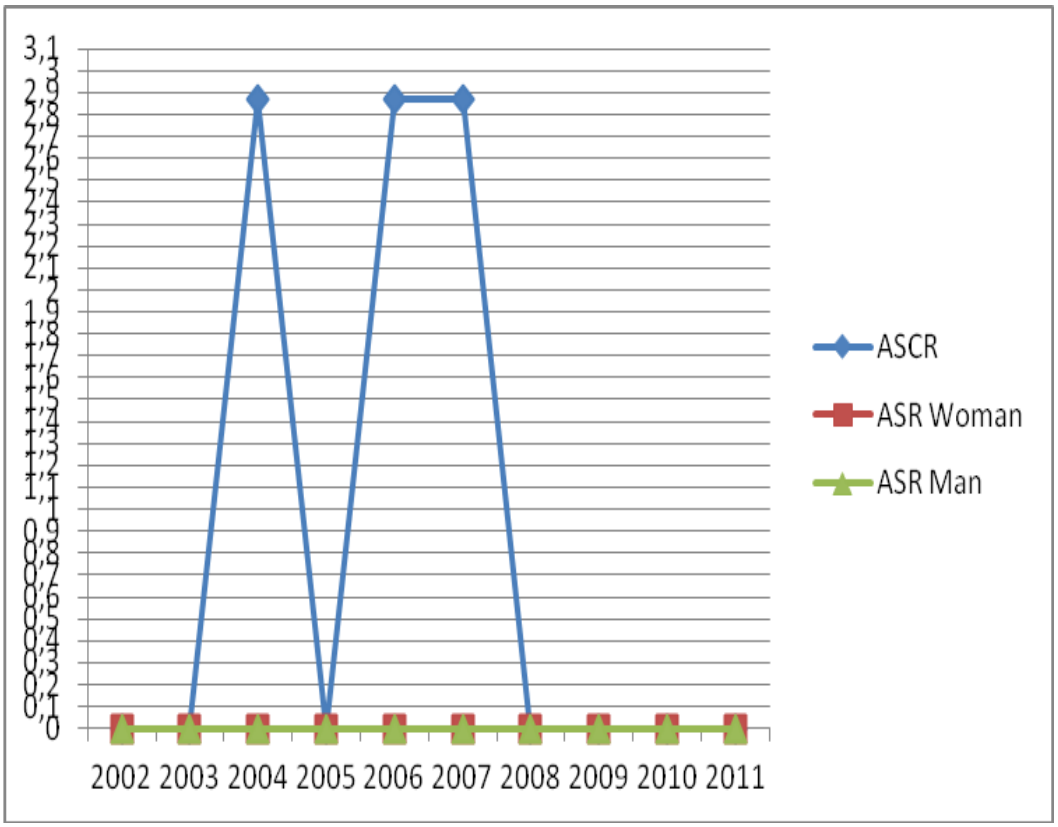


Figure 10 : ASR and ASCR score of NPC patients for 10 – 14 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

For the chart of 10-14 years old group, no available data to count both ASR for women and men, so we can not compare the score. While the highest ASCR score is in 2006-2007 which is 2,87.

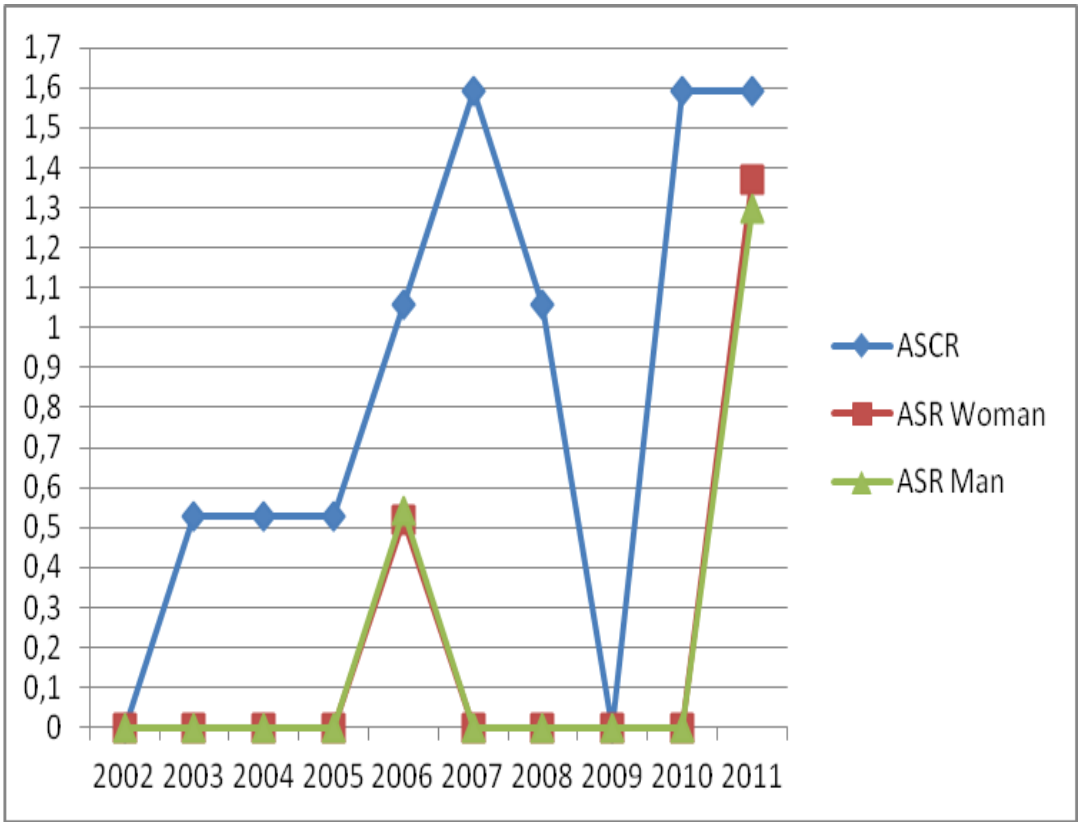


Figure 11 : ASR and ASCR score of NPC patients for 15 – 19 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the chart above it can be seen that there is an increase ASCR score from year to year, unless in year 2008 and 2009. And for both ASR and ASCR score the highest scores are both in 2011, with score as big as 1,59 for ASCR, 1,37 for women ASR, and 1,3 for men ASR. In this year generally women ASR showed higher score than men ASR.

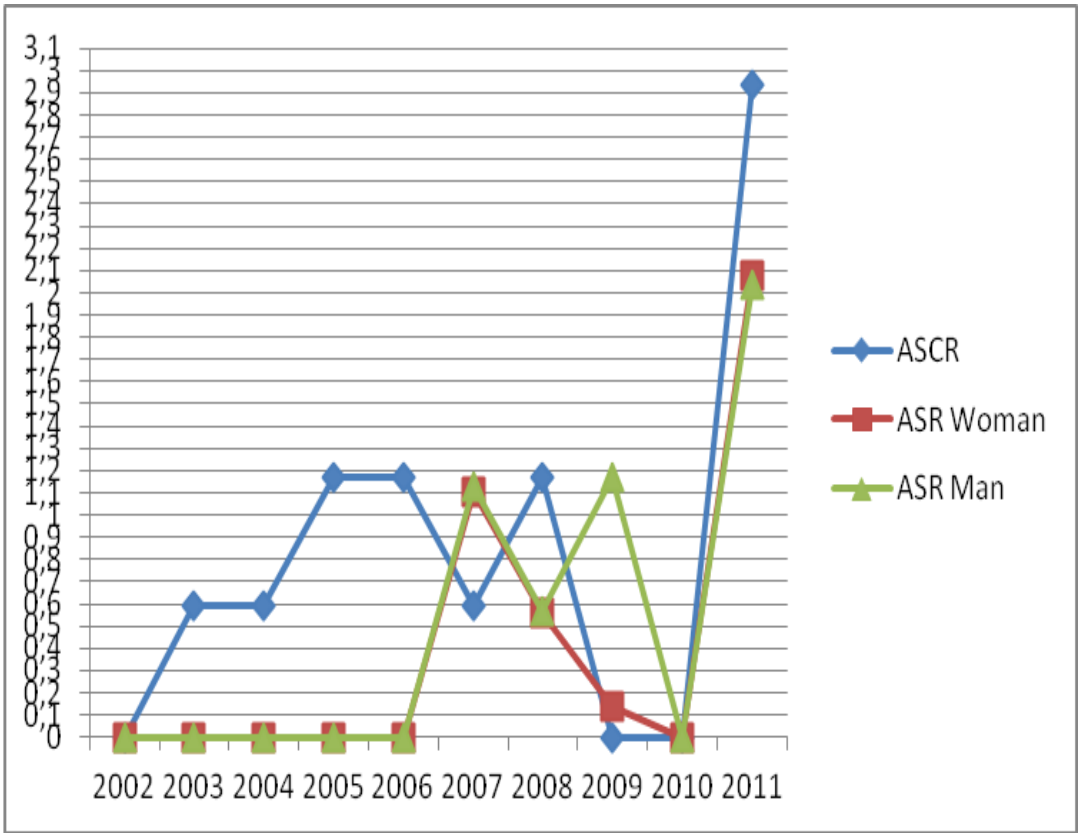


Figure 12 : ASR and ASCR score of NPC patients for 20 – 24 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

Like years before, the highest score is in 2011 with ASCR score as big as 2,94; women ASR 2,08; men ASR 2,04. Generally, man ASR is higher than woman, except in year 2011.

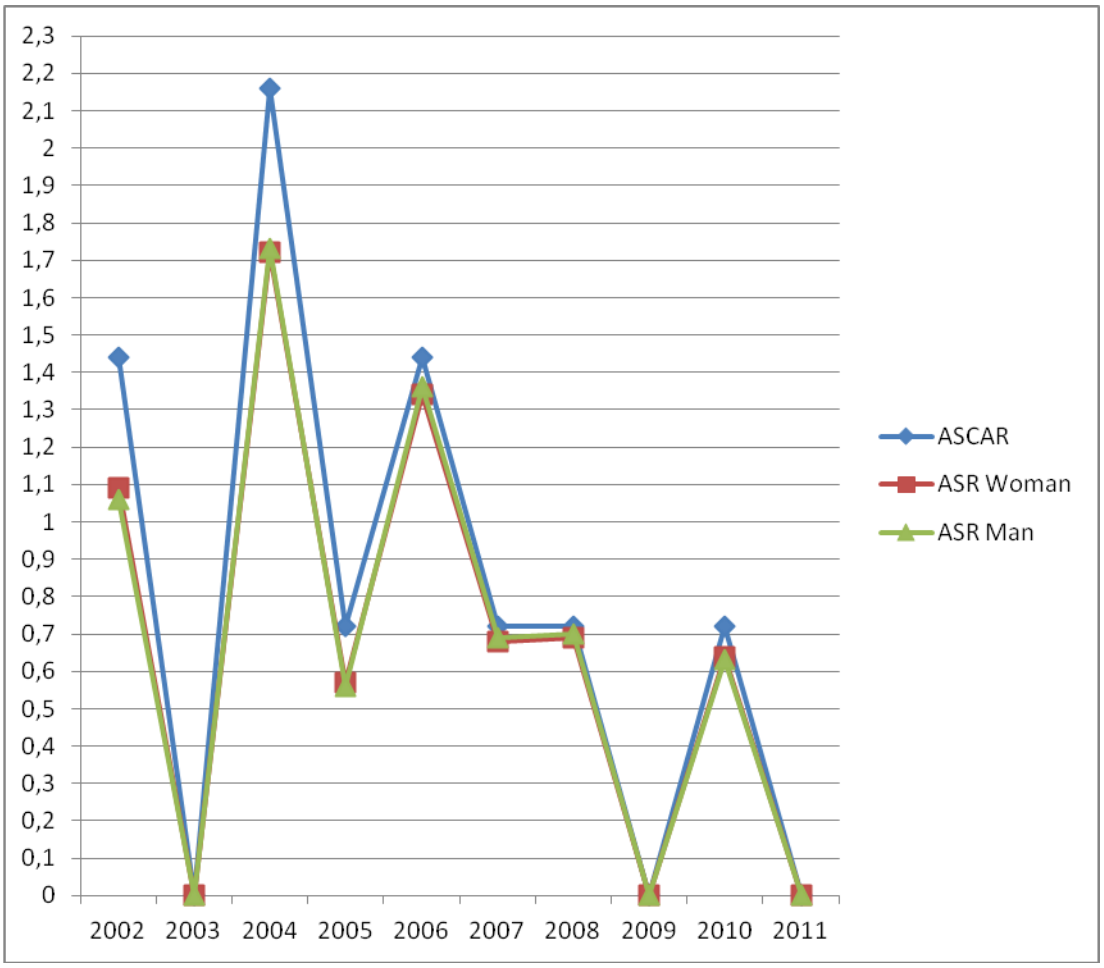


Figure 13 : ASR and ASCR score of NPC patients for 25 – 29 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

Different from years before, for 25-29 years old group chart, the highest score is in year 2004, with ASCR score as big as 2,16. While women ASR score is as big as 1,72, men ASR as big as 1,73. The following years there is a decrease in both ASCR and ASR. Generally, men ASR score is higher than women, except in year 2005 and 2010.

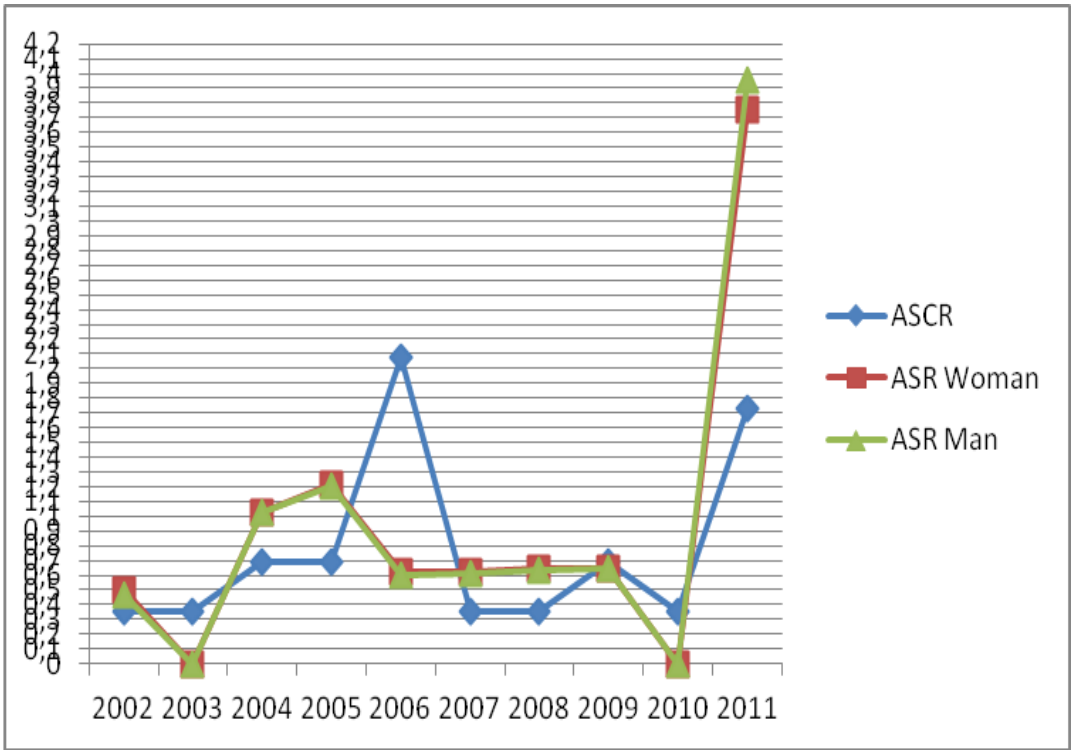


Figure 14 : ASR and ASCR score of NPC patients for 30 – 34 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

For 30-34 years old group chart, there is a significant increase in both ASCR and ASR in year 2011 with the highest ASCR score as big as 2,08, women ASR is 3,75, and men ASR is 3,95. Generally, woman ASR is higher than man ASR.

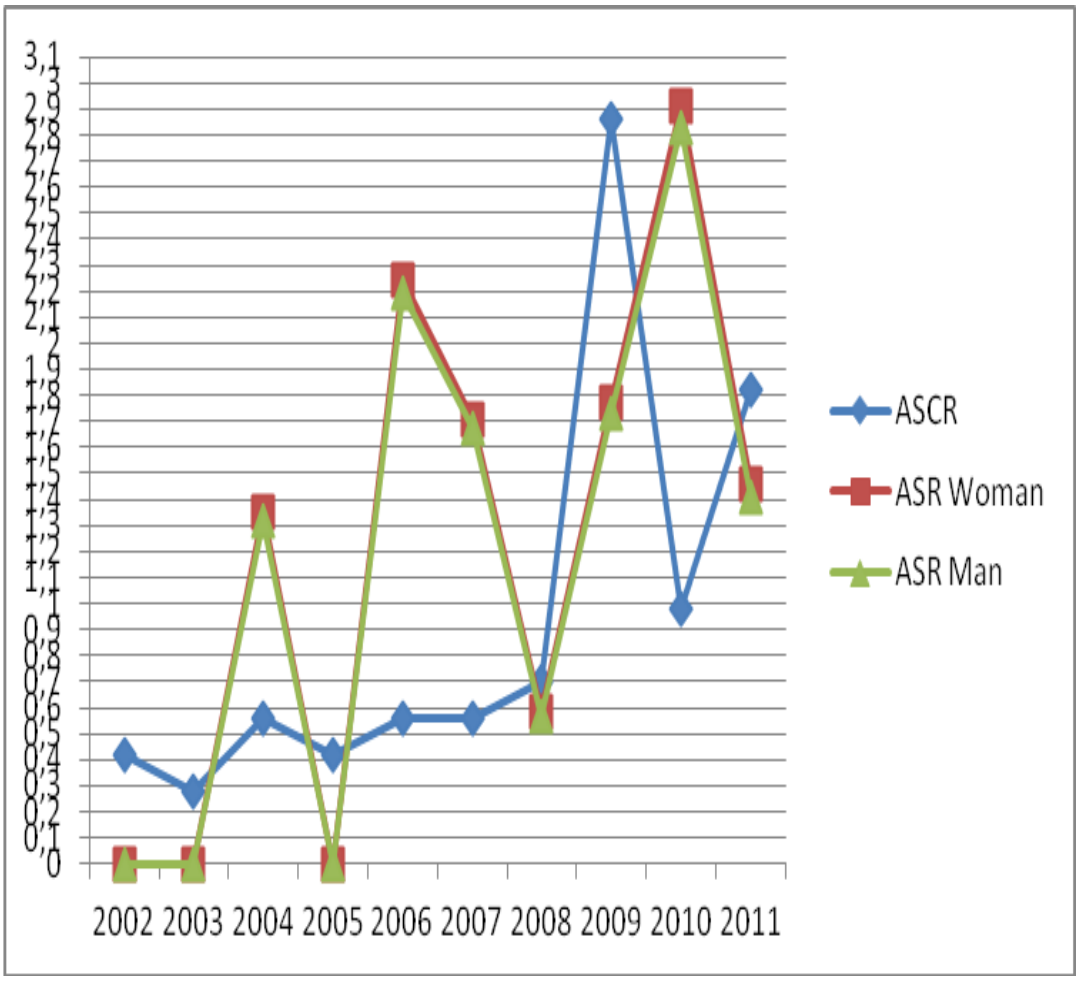


Figure 15 : ASR and ASCR score of NPC patients for 35 – 39 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

There is an increase in both ASR and ASCR every year in 35-39 years old group chart, with the highest score is in 2011, and ASCR score as big as 1,82, women ASR is as big as 1,46, men ASR is as big as 1,41. Line of ASR score development is always higher in women than in men, eventhough they are only slightly different.

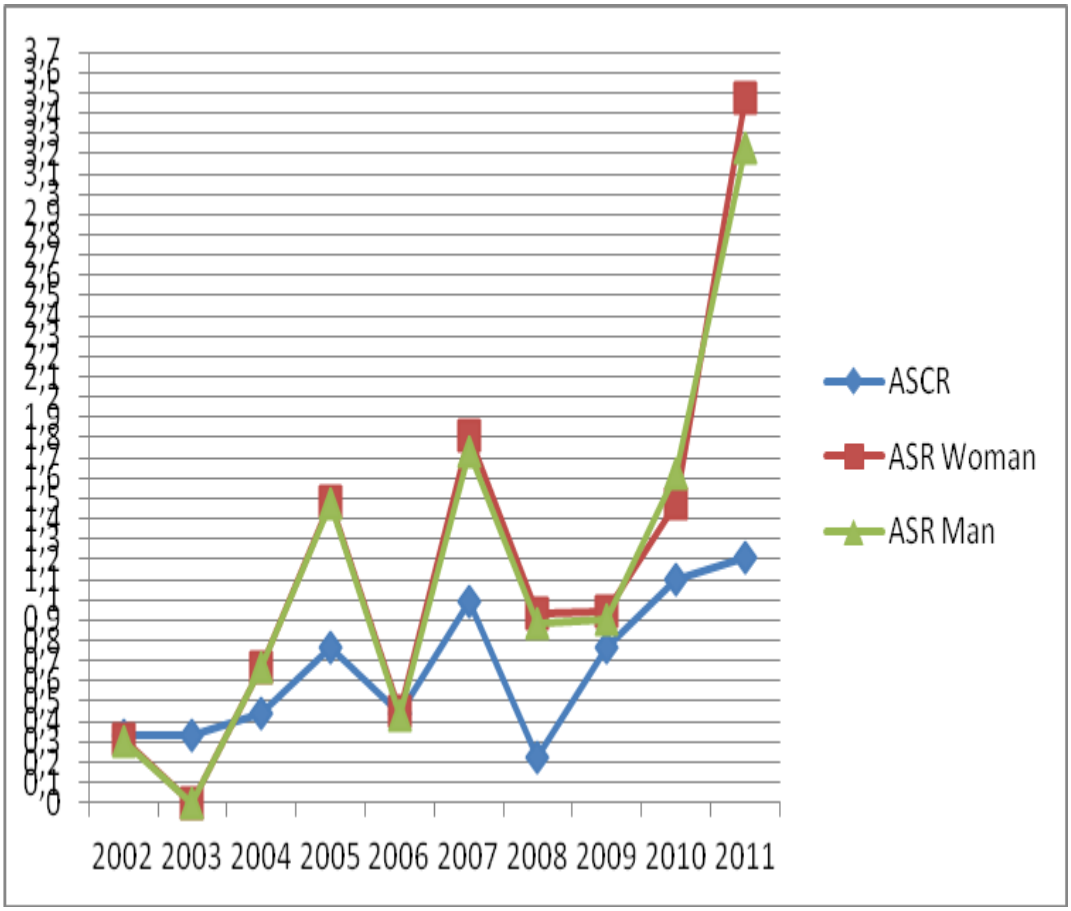


Figure 16 : ASR and ASCR score of NPC patients for 40 – 44 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the 40-44 years old, it can be seen that both ASCR and ASR has the highest score in 2011. With the score of ASCR as big as 1,21, women ASR as big as 3,47 and men ASR as big as 3,23. Generally, ASR line in women is higher than in men from year to year.

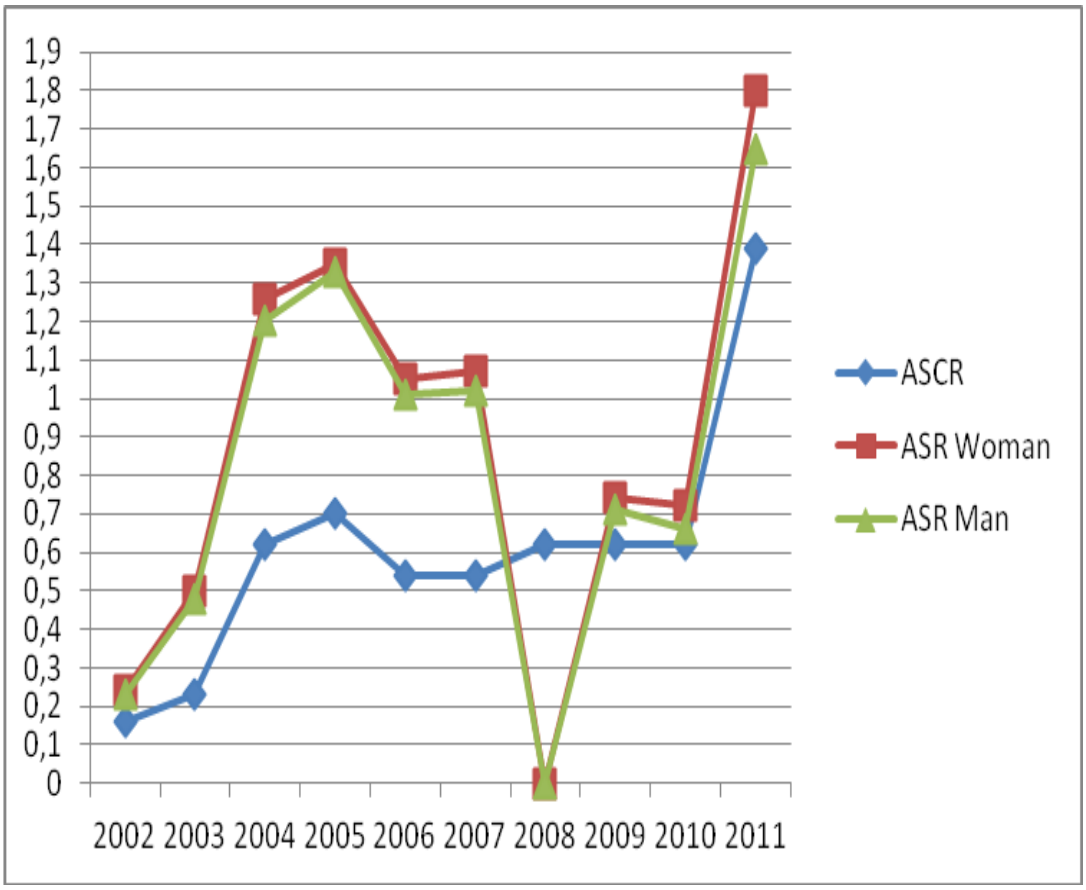


Figure 17 : ASR and ASCR score of NPC patients for 45 – 49 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the chart above it can be seen that there is an increase in ASR and ASCR score, and the highest score is in 2011 with ASCR score as big as 1,39, men ASR score is as big as 1,65 and women ASR is 1,8. In this year there is a difference from women and men ASR score as seen from the score disparity, which is generally women ASR is higher than men.

Figure 18 : ASR and ASCR score of NPC patients for 50 – 54 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

In the 50-54 years old group chart, there is an increase until year 2006, which later decrease until year 2008 and rise again until year 2011. The highest score is in 2011 with ASCR value 0,66, women ASR 1,57, and men ASR 1,32. In this year, man ASR score higher than woman in 2006, 2007, 2008, and 2009.

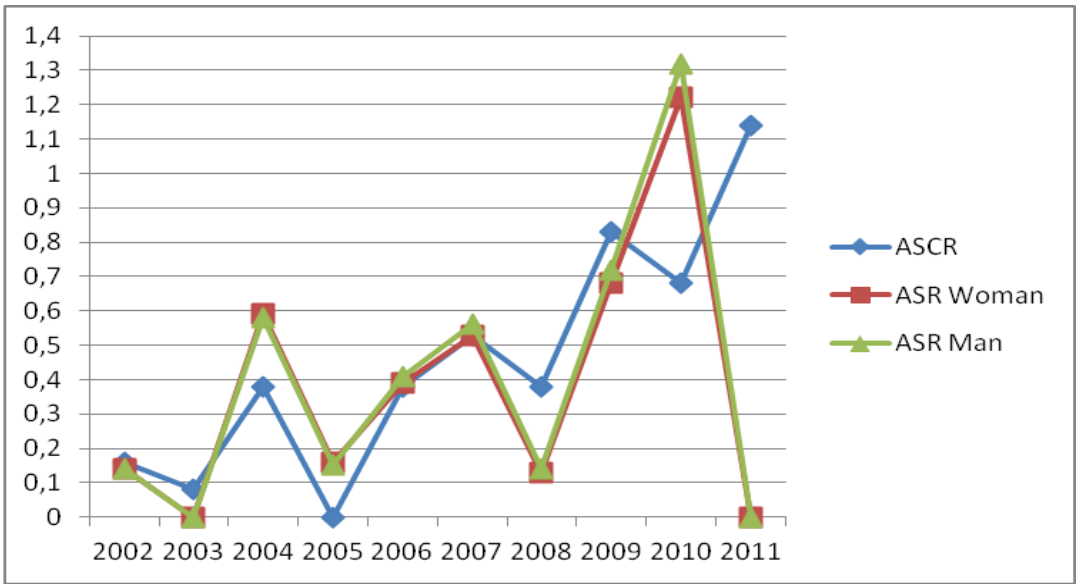


Figure 19 : ASR and ASCR score of NPC patients for 55 – 59 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the chart above we can see that there is an increase in both ASCR and ASR score from year to year, with the highest score for ASCR is in 2011, and the highest score for both men ASR and woman ASR in year 2010. ASCR score 1,14, men ASR score 1,328, women ASR score 1,22.

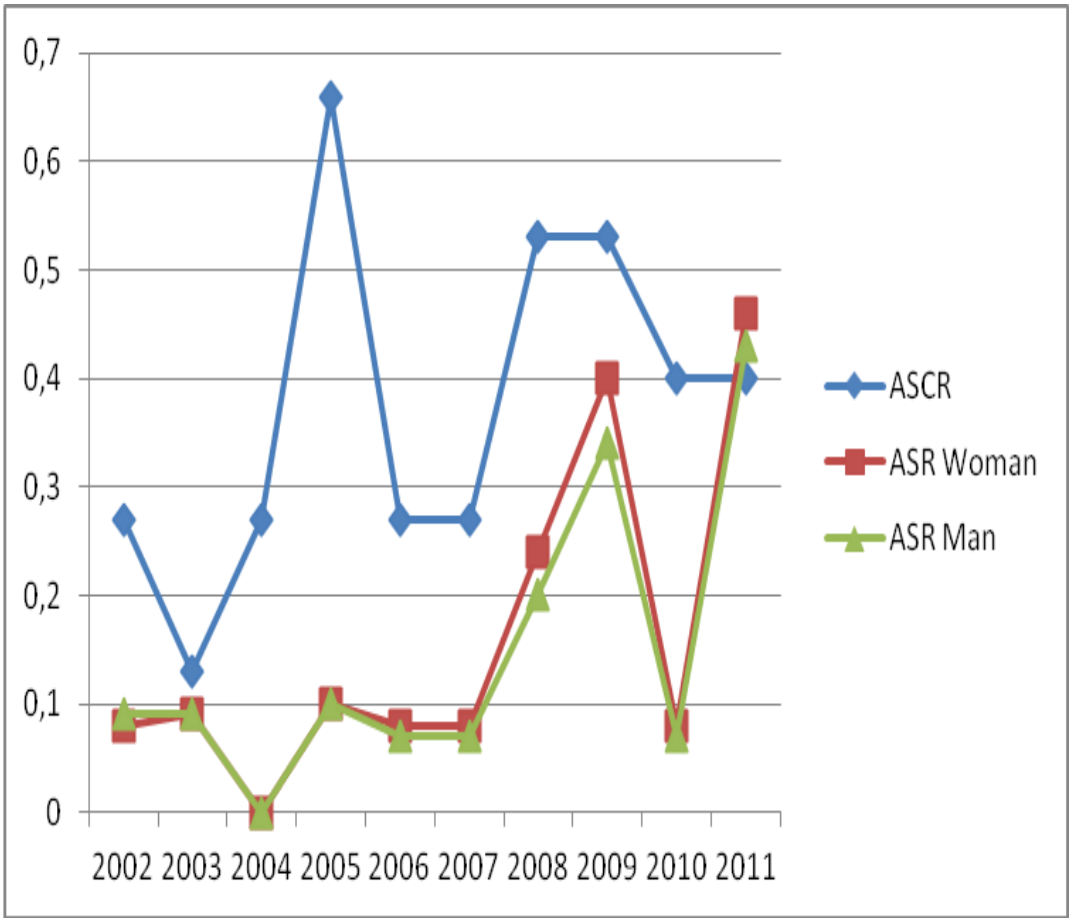


Figure 20 : ASR and ASCR score of NPC patients for 60 – 64 years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

The highest score for ASCR 60-64 years old is in year 2005, with ASCR score 0,66. The highest score for ASR is in year 2011,with men ASR 0,43, and women ASR as big as 0,46. Generally ASR women is higher than man ASR.

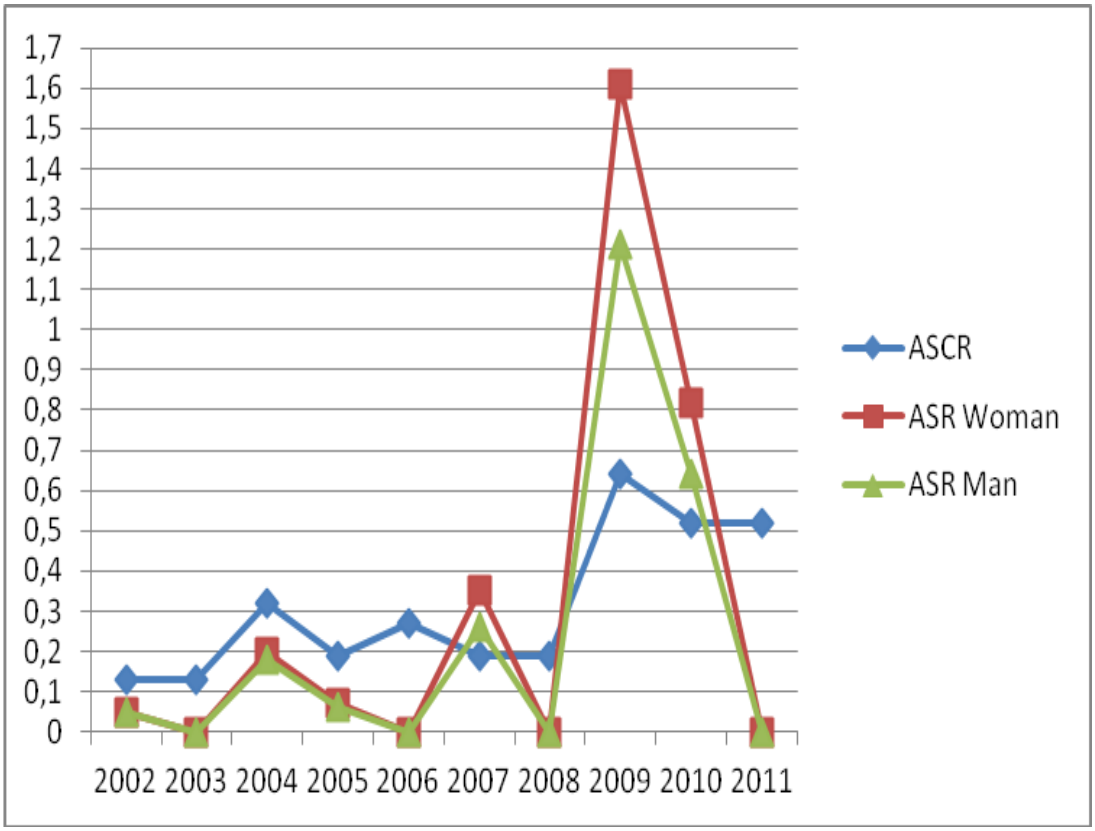


Figure 21 : ASR and ASCR score of NPC patients for 65+ years old group from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the chart above it can be seen that the women ASR is higher than men ASR from each year. The highest score is in 2009, with ASCR score 0,64, women ASR score 1,61, and men ASR is 1,21. From 2002-2011, women ASR is always higher than men ASR.

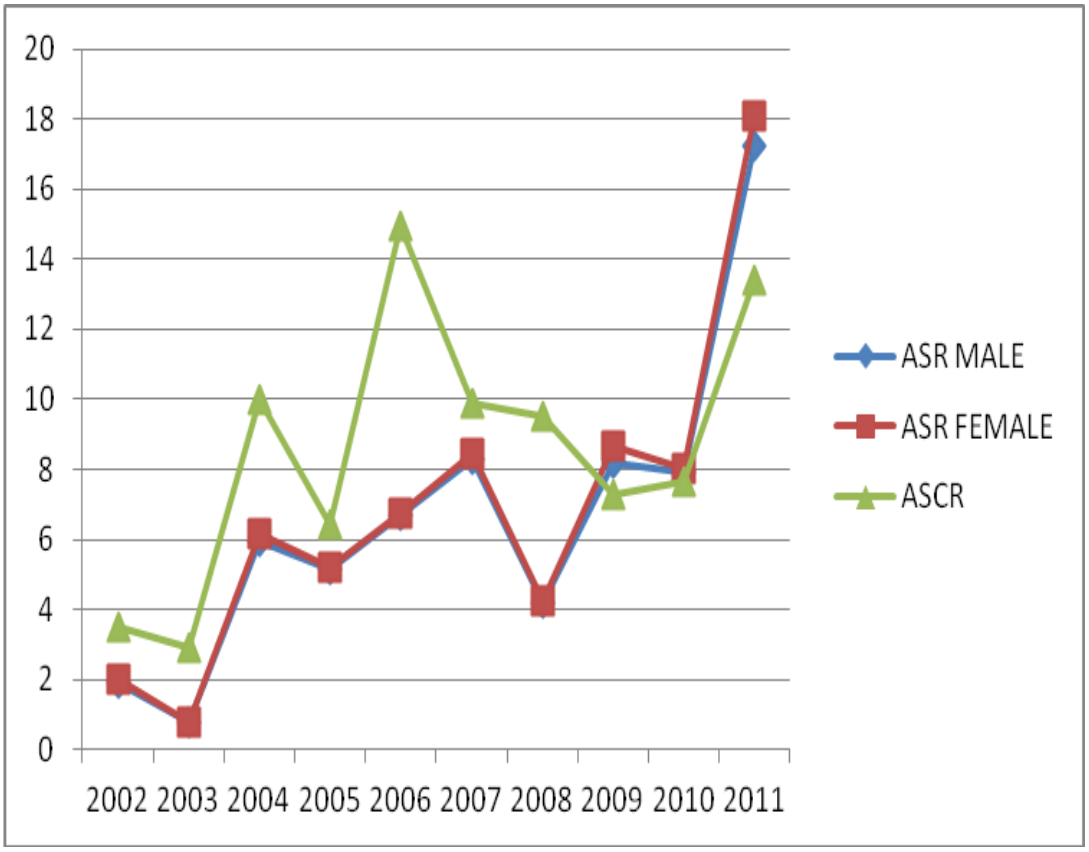


Figure 22 : ASR and ASCR score of NPC patients from 2002 through to 2011 at Dr. Kariadi Central Hospital

From the chart above, we can clearly see the difference that there is a total increase in women ASR, men ASR, and ASCR score from year 2002 until 2011. And the highest point is in 2011. With the ASCR score as big as 85,51, men ASR 66,26, and women ASR 68,35, then the comparison between men ASR and women ASR in year 2002-2011 is 1:1,03.

From the result above, we can answer the hypothesis from this study that there is an increase in ASR and ASCR score from year to year in RSUP Dr. Kariadi

Semarang from 2002-2011 and there is also a difference in the ratio of nasopharyngeal carcinoma incidence between men and women. But the ratio is does not follow the trend. Until now, researchers have not found references from other countries in which the women ASR is higher than men ASR. It can be caused by unavailability of data in some groups of age, so that the counting result became inaccurate.

CHAPTER VI

DISCUSSION

To count ASR score for men and women, the population (Nx in formula) are medical record of NPC patients who lived in Semarang, have a sex and age data, diagnose as NPC patient during January 1st 2002 until 31st 2011. And for ASCR, the population are medical record of NPC patients that clearly state the sex and the age of the patients.

From the result of this study, it can be seen clearly that there is an increase in the number of NPC patients from year 2002 until 2011, which at the beginning there was only 20 patients in 2002 but then increased to 95 in 2011. This results showed similarity with the study from Nwaorgu OG and Ogunbiyi JO at University College Hospital Ibadan Cancer Registry which declared that there is a steady increase in the incidence of nasopharyngeal cancer over the last two decades (during 1981 - 2000).[32] It is also supported by the data from National Cancer Institute that The overall survival of children and adolescents with NPC has improved over the last four decades.[33]

Generally, the highest number of patient is in the range of 45-49 years old with a total of 78 patients. The second most is in the range of 50-54 years old with a

total of 65 patients. Then 40-44 and 55-59 years old with a total of 60 patients. This is also supported by the result of the study in other country. The first result came from Bingjian Feng who declared that In Asian high-risk populations, the incidence rises in adolescence and peaks at 45-55 year.[34] There is also a suggestion from Yunardi, et al in 2010 who declared that from the aspect of age, the most number of patients in the range of 41-50 years old (29,41%).

ASR score also can be seen clearly that there is an increase score from NPC patients during 2002 – 2011 compare with the study before, from Sarjadi.

Table 8 : ASR Score for men and women during 1985 – 1989 and 2002 - 2011

Year	ASR	
	Men	Women
1985	2,92	2,58
1986	4,51	1,16
1987	7,71	1,91
1988	3,72	1,99
1989	4,63	1,83
2002	1,88	2
2003	0,77	0,79
2004	5,97	6,14
2005	5,13	5,21
2006	6,67	6,73
2007	8,3	8,46
2008	4,2	4,23
2009	8,19	8,67
2010	7,92	8,01
2011	17,23	18,11

It means that with this methods which is compare the year and the age, can show the incidence of NPC is rises in every year, exept in 2002 until 2003, maybe it because no accurate data is available so the score is lower than a year before.

But, based on sex, this study does not follow the trend. Until now, researchers have not found references from other countries in which the women ASR is higher than men ASR. It can be caused by unavailability of data in some groups of age, so that the counting result became inaccurate. Or it may have been because of one or more factors which is actually related with the increase of nasopharyngeal carcinoma incidence in women, so there is a need to study more to unveil the relationship of that factor towards the incidence of nasopharyngeal carcinoma based on sex along with more accurate data to infere also a more accurate conclusion.

Some of the factors and their effect on nasopharyngeal carcinoma incidence that need to study more are:

Table 10 : The factors and their effect on nasopharyngeal carcinoma incidence [32]

Factor	Strength of association	Consistency of association
EBV	Strong	Consistent
Salt-preserved fish	Moderate to strong	Consistent
Family history of NPC	Strong	Consistent
HLA class I genotypes	Moderate to strong	Consistent
Other preserved foods	Moderate	Fairly consistent
Lack of fresh fruits and vegetables	Moderate	Fairly consistent
Tobacco smoke	Weak to moderate	Fairly consistent
Chronic respiratory tract conditions	Moderate	Fairly consistent
Other inhalants	Weak to moderate	Inconsistent
Herbal medicines	Weak to moderate	Inconsistent
Formaldehyde	Weak to moderate	Inconsistent
Occupational dusts	Weak to moderate	Inconsistent

CHAPTER VII

CONCLUSION AND SUGGESTION

7.1. CONCLUSION

The highest number of patient is in the range of 45-49 years old with a total of 78 patients. The second most is in the range of 50-54 years old with a total of 65 patients. Then 40-44 and 55-59 years old with a total of 60 patients. Based on age, ASR and ASCR are consistently increase, exept in year 2002 and 2003 if it compare with the study before and compare in every year. And both of ASR and ASCR score are peaks in year 2011 which is 13,4 for ASCR, 17,23 for men ASR and 18,11 for women ASR. But based on sex, this study does not follow the trend, a women ASR is higher than men ASR. It can be caused by unavailability of data in some groups of age, so that the counting result became inaccurate. Or it may have been because of one or more factors which is actually related with the increase of nasopharyngeal carcinoma incidence in women,

7.2. SUGGESTION

It is a need to study more to unveil the relationship of that factor towards the incidence of nasopharyngeal carcinoma based on sex along with more accurate data to infere also a more accurate conclusion. Also for Anatomical Pathology Laboratory of dr. Kariadi Central Hospital Semarang, its better if all of the medical record data is save in a software to make the resesarcher more easily to get the data, and complete the medical record data, for example the complete address of the patients so it makes the data clear enough and more accurate.

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