Research Report

Socioeconomic inequality in stage at diagnosis of nasopharyngeal carcinoma: a cross-sectional study

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ABSTRACT

Background: Nasopharyngeal carcinoma (NPC) is head and neck cancer with the highest incidence in Indonesia, and leads Indonesia as one of the countries with the highest incidence of NPC in the world. Early diagnosis is an important prognostic factor in NPC management. However, most of the NPC patients were diagnosed at the advanced stage. Delayed diagnosis is contributed by several factors including socioeconomic status. **Objective:** To find out the association between socioeconomic status with stage at diagnosis of NPC patients in Indonesia. **Methods:** A cross-sectional study was conducted and 57 NPC patients were consecutively recruited from ENT clinic Margono Soekarjo Hospital as study subjects. Socioeconomic status was measured by income level, educational level, employment status, and health insurance coverage. Stages at diagnosis were categorized into early and advanced stage based on the clinical stage. Degree of socioeconomic inequality was analyzed by logistic regression. **Results:** Income level below poverty line (OR 5.39; 95% CI: 1.36-22.42), basic educational level (OR=3.81; 95% CI: 1.11–13.09), currently employed (OR=3.59; 95% CI: 1.07–12.00) had higher probability to be diagnosed at advanced stage. After multivariate analysis, only employment status (OR=5.74; 95% CI: 1.25 – 26.21) contributed significantly to probability of being diagnosed at advanced stage. **Conclusion:** Socioeconomic status was associated with stage diagnosis of NPC levels. Socioeconomic inequality in stage at diagnosis of NPC patients did exist in Indonesia, and employment status was the most contributing factor.

Keywords: Socioeconomic status, inequality, stage at diagnosis, nasopharyngeal carcinoma

ABSTRAK

Latar belakang: *Karsinoma nasofaring (KNF) merupakan keganasan kepala leher dengan insidens tertinggi di Indonesia, dan menyebabkan Indonesia menjadi salah satu negara dengan insidens KNF tertinggi di dunia. Diagnosis dini merupakan salah satu faktor prognostik penting dalam penatalaksanaan KNF. Meskipun demikian, sebagian besar pasien KNF didiagnosis pada stadium lanjut. Diagnosis terlambat dipengaruhi oleh berbagai faktor, antara lain status sosial ekonomi.* ***Tujuan:*** *Mengetahui hubungan antara kesenjangan sosial ekonomi dengan stadium diagnosis pasien KNF di Indonesia.* ***Metode:*** *Desain penelitian adalah studi potong lintang, dengan 57 subjek penelitian diambil secara konsekutif dari klinik THT RS Margono Soekarjo. Status sosial ekonomi diukur melalui tingkat penghasilan, tingkat pendidikan, status pekerjaan, dan cakupan asuransi kesehatan. Stadium diagnosis diukur berdasarkan stadium klinis, dan dikategorikan menjadi stadium awal dan stadium lanjut. Tingkat kesenjangan sosial ekonomi dianalisis menggunakan regresi logistik.* ***Hasil:*** *Tingkat penghasilan di bawah garis kemiskinan (OR=5,39, CI 95%: 1,31–22.42), tingkat pendidikan dasar (OR=3,81, CI 95%: 1,11–13,09), sedang bekerja (OR=3,59, CI 95%: 1,07–12,00), mempunyai peluang lebih tinggi untuk didiagnosis pada stadium lanjut. Hasil analisis multivariate menunjukkan hanya status pekerjaan (OR=5,74, CI 95%: 1,25–26,21) yang secara bermakna meningkatkan peluang didiagnosis pada stadium lanjut.* ***Kesimpulan****: Status sosial ekonomi berhubungan dengan stadium diagnosis pasien KNF di Indonesia. Terdapat kesenjangan sosial ekonomi pada stadium diagnosis pasien KNF di Indonesia, dan status pekerjaan merupakan faktor yang memberikan kontribusi terbesar.*

Kata kunci: *Status sosial ekonomi, kesenjangan, stadium diagnosis, karsinoma nasofaring*

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INTRODUCTION

Nasopharyngeal carcinoma (NPC) is the most common head and neck cancer in Indonesia. The incidence of NPC in Indonesia is about 6.2 per 100,000 population, and currently is ranked fourth in the overall cancer incidence in Indonesia after breast cancer, cervical cancer, and skin cancer.[1] The distribution of NPC incidence related to the endemic infection of Epstein-Barr Virus (EBV), environmental and life style factor, and genetic susceptibility.[2-4] South-east Asia region, including Indonesia, is endemic area of EBV. Therefore, the incidence of NPC in Indonesia is one of the highest globally.[1,5,6]

Early diagnosis is one of the most important prognostic factor in NPC treatment. There is significance difference in term of prognosis between NPC patient who diagnosed in early stage, compared to the advanced stage.[7] NPC patient who diagnosed in early stage will reach five-year survival rate until 72 percent, while the advanced stage only reach 38 percent of five-year survival rate. Advanced stage diagnosis in NPC patients also associate to the lower quality of life of the NPC patients, increased financial burden, and heavier psychological burden for the patients and their caregivers.[1]

Advanced stage diagnosis in cancer patient are caused by both patient's factor and medical services factors. Low understanding and awareness of the disease, psychological worries of being a cancer patient, lack access to necessary medical services due to financial and geographical barrier are the most common cause of advanced diagnosis contributed from the patient's side. From the medical service's side, late referral to secondary care, inadequacy of competent medical personnel, and diagnostic facilities are the most common cause of advanced stage diagnosis.[8-11]

The association between health knowledge, awareness, and behavior with health status is well understood. Access to medical services is also regarded as important determinants of health status. Both factors are closely associated to socioeconomic status. Finding from previous studies showed that in general socioeconomic status significantly associated to health status. Highly-educated, rich, and well-employed individuals tend to have better health status than the opposite individuals status.[12-14] Result from the recent study also showed cancer patients who had lower socioeconomic status will be later diagnosed compare to the higher ones. This study was limited to several types of cancer such as breast cancer, lung cancer, prostate cancer, cervical cancer, and melanoma.[15-18] Until recently, there is no single study in Indonesia try to explore the association of socio-economic status with stage at diagnosis in NPC patients. However, previous studies from other countries, and empirical findings showed most of the NPC patients are lack of medical service access, and had lower knowledge about the disease. Therefore, it is important to further elaborate the association of socioeconomic status and time of diagnosis in NPC patients in Indonesia.

The study aimed to explore the association between socioeconomic status and stage at diagnosis in NPC patients. This study also tried to find whether socioeconomic inequality existed in stage at diagnosis of NPC patients. Findings from this study are expected to contribute in development of diagnosis and treatment of NPC patients in Indonesia.

METHODS

This was an analytic observational study with cross-sectional approach. Study subjects were recruited from NPC patients who visited

Ear, Nose, and Throat (ENT) clinic in Margono Soekarjo Hospital between January – December 2014. Margono Soekarjo Hospital is a teaching hospital for Faculty of Medicine Universitas Jenderal Soedirman, and the largest public hospital in south west area of Central Java Province, Indonesia. The minimum sample size was 51 subjects, and calculated based on formula from Lemeshow.[19] Subjects were taken consecutively based on several inclusion criteria which are confirmed diagnosis of NPC by ENT specialist and histopathological result, age 15 years and above, and gave consent to participate in the study.

Stage at diagnosis was described by stage (*stadium*) of the NPC when the patients firstly diagnosed. The NPC stage were categorized in two groups, namely early diagnosis and advanced diagnosis. Early diagnosis was defined as the NPC patients were firstly diagnosed in stage I and stage II. If the patients firstly diagnosed in stage III or IV, then they were categorized as advanced diagnosis. The NPC stage data were taken from patient's medical record. Socio-economic status was measured using three main indicators which are educational level, employment, and income level. Health insurance status was added as a proxy of medical service access. Educational level was measured by the highest level of school graduated by the patients. Educational level was categorized into basic level which is graduated at maximum from junior high school, and high level if the patients were graduated at least from senior high school and above. Employment status was measured by determining whether the patients had a formal employment. It was categorized in to employed and unemployed group. Income level was measured by monthly per capita income.[20] Income level was categorized in to poor group and above poor group based on poverty line from *Badan Pusat Statistik* (Centre of Statistics Body).[21] Data were primary taken from the study subjects using standardized questionnaire. Basic demographic data of the subject were also measured in this study.

Categorical data were described using frequency distribution and percentage, while numerical data were describe using mean and standard deviation. To measure the association between socio-economic status and stage at diagnosis, simple logistic regression was conducted. Multiple logistic regression was conducted to measure the effect of adjusted socio-economic indicators to the stage at diagnosis. Exponential Beta or Odd Ratio with 95% CI was used to measure the extent of socio-economic inequalities in the stage at diagnosis. All data were analyzed using statistical package IBM© SPSS© version 22.00. This study was approved by Medical Research Ethic Committee, Faculty of Medicine, Universitas Jenderal Soedirman.

RESULTS

Data were collected since February to April 2015 in ENT clinic Margono Soekarjo Hospital and the patients' residence. Totally, 57 subjects were successfully recruited and participated in the study. Basic demographic data and all study's variables were described in table 1.

The mean age of the subject was 47.9 years, while study subjects were predominantly male (68.4%), had basic level of education (54.4%), currently employed (59.6%), had income below poverty line (54.4%), and covered by health insurance (82.5%).

In term of stage diagnosis, this study categorized stage at diagnosis into two categories, namely early stage which included subjects with stage I and stage II diagnosis, and advanced stage comprised of patients with stage III and stage IV diagnosis. Most of the study subjects were late diagnosed at stage IV (38.6%) and stage III (33.3%). Based on the category of stage at diagnosis, table 2 showed the comparison of study subject characteristics between both groups.

The findings above showed that age and gender somewhat were not different between both groups. Most of the subjects were men and

Table 1. Basic characteristics of study subjects

Variables	% or mean
Age (years)*	47.9 (14.1)
Gender	
Male	39 (68.4)
Female	18 (31.6)
Educational level	
Basic	31 (54.4)
High	26 (45.6)
Employment status	
Employed	34 (59.6)
Unemployed	23 (40.4)
Income level	
Below poverty line	26 (45.6)
Above poverty line	31 (54.4)
Health insurance status	
Insured	47 (82.5)
Uninsured	10 (17.5)
Stage at diagnosis	
Stage I	3 (5.3)
Stage II	13 (22.8)
Stage III	19 (33.3)
Stage IV	22 (38.6)
Total	**57 (100)**

*Age was described in mean (standard deviation), other variables were described in frequency (percentage)

Table 2. Comparison of study subject characteristics based on stage at diagnosis

Variables	Early stage	Advanced stage
Age*	45.2 (19.6)	49,1 (11.4)
Gender		
Male	12 (75.0)	27 (65.9)
Female	4 (25.0)	14 (34.1)
Educational level		
Basic	5 (31.3)	26 (63.4)
High	11 (68.7)	15 (36.6)
Employment status		
Employed	6 (37.5)	28 (68.3)
Unemployed	10 (62.5)	13 (31.7)
Income level		
Below poverty line	3 (18.8)	32 (56.1)
Above poverty line	13 (81.2)	18 (43.9)
Health insurance status		
Insured	14 (12.5)	33 (80.5)
Uninsured	2 (87.5)	8 (19.5)

*Age was described in mean (standard deviation), other variables were described in frequency (percentage)

at the age of 45 years old or above. It was clearly described that subjects who were diagnosed at advanced stage had lower educational level, mostly employed, had income level below poverty line, and predominantly had health insurance coverage. Descriptive findings from this study showed that subjects with lower socio-economic status were disproportionately distributed to advanced stage diagnosis group, except for the employment status.

Table 3 showed results from simple regression logistic analysis. There were significant associations between socioeconomic status indicators including educational level, employment status, and income level with stage diagnosis of NPC patients. There was no significant association between health insurance status with the stage at diagnosis of NPC patients. Results from the analysis also clearly showed the degree of socioeconomic inequality in stage at diagnosis of NPC patients. Income level had the highest degree of inequality. Subjects who had income level below poverty line had the odd ratio 5.53 (95% CI: 1.36 – 22.42) to be diagnosed at the advanced stage compared to those who had income above poverty line. Similar results were found in educational level, and employment status although in the lesser extent.

Multiple logistic regression analysis was conducted to adjust the interaction effect among socioeconomic indicators, and to determine the contribution of each socioeconomic indicators to advanced stage at diagnosis of NPC patients. Table 4 showed different result compare to the result from previous analysis. Only one socioeconomic indicator which was employment status had significant association with the stage at diagnosis of NPC patients. Subjects who were currently employed had

the odd ratio 5.74 (95% CI: 1.25 – 26.21) to be diagnosed at advanced stage compared to subjects who currently unemployed. In term of income level, there was no significant association between income level and stage at diagnosis. However, if we referred to value of the odd ratio 4.53 (95% CI: 0.68 -30.32) which was quite high there was a high tendency subjects with income level below poverty line would likely be diagnosed at the advanced stage.

Table 3. Simple logistic regression analysis between socio-economic status and advanced stage at diagnosis of NPC patients

Variables*	OR (Exp B)	95%CI	P
Basic educational level	3.81	1.11 – 13.09	0.02
Employed	3.59	1.07 – 12.00	0.03
Income level below poverty line	5.53	1.36 – 22.42	0.01
Uninsured	1.69	0.31 – 9.02	0.53

*high educational level, unemployed, income level above poverty line, insured are used as reference groups

Table 4. Multiple regression analysis between socio-economic status and advanced stage at diagnosis of NPC patients

Variables*	OR (Exp B)	95% CI	P
Basic educational level	1.61	0.26 – 10.06	0.61
Employed	5.74	1.25 – 26.21	0.02
Income level below poverty line	4.53	0.68 – 30.23	0.11
Uninsured	1.92	0.29 – 12.78	0.49

*high educational level, unemployed, income level above poverty line, insured are used as reference groups adjusted for gender.

DISCUSSION

Our findings showed that study subjects predominantly were male, and at the age of mid-forty years old. The results were consistent with findings from previous studies, especially in endemic region NPC in East Asia and South-East Asia.[1-4,22] The peak incidence of NPC was related to exposure time of several risk factors. EBV infection, in addition with dietary pattern, smoking habit, and occupational agents were responsible for the carcinogenesis process in NPC, which take various period of times to produce apparent clinical symptoms in individual. EBV infection in early life clearly play major role in the development of NPC. EBV infection was commonly found in approximately 90 percent of world population, although mostly are subclinical. The difference level of incidence among different geographical areas indicate that environmental and genetic factors are contributing significantly to the development of NPC.[2-4,23]

In term of socioeconomic status and health access indicators, our study subjects mostly had basic educational level, currently employed, had income level above poverty line, and had health insurance coverage. We found similar result from prior studies about educational level variable, but we had different results in variables of employment, income level, and health insurance status.[3,4,24] It is commonly agreed that higher educational level will have better health status. Years of schooling represents socioeconomic status, and link with the higher knowledge and awareness about health, and self-ability to utilize health care.[14] Our findings confirmed previous studies, both in total subjects and after categorized into early and advanced stage.

Our result, both in total subjects, and categorized subjects showed that employed subjects were majority in proportion compare than unemployed subjects. This is contrary to the previous results which showed most of cancer patients are unemployed or in low-level

type of occupation.[15,25] Most of the subjects totally had income level above poverty line, but if we look at the data after categorization, it is obvious that subjects diagnosed at advanced stage were mostly had income level below poverty line. This finding is similar with the previous studies. It is well understood that individuals who have lower income level had lower health status due to limited access to necessary health resources, and lower general living condition which influence health status.[10,15,26-28] We will elaborate this finding in the context of socioeconomic inequality.

Majority of our subjects had health insurance coverage. This finding was different to the result from prior study. Most of subjects in previous study usually had no coverage of health status.[24] Health insurance as a tool to remove financial barrier play major role in individual access to medical service, including regular medical check-up, screenings, and other preventive measure to diagnose cancer as early as possible. Most of our study subjects were diagnosed at advanced stage. It is similar to findings from previous studies.[1-3,23,29] NPC is one of cancer which has no specific symptoms, and most of the patients will complain and seeking medical treatment when the disease has seriously disturbed their activities, and usually are in already in the advanced stage.

In the context of socioeconomic inequality, our study showed different results between bivariate and multivariate analysis. In the final analysis, only employment status which significantly had the higher probability to be diagnosed at advanced stage. This finding is somewhat different with general premise that people who are employed, which are assumed had better socioeconomic status should have a better health status or in this context should have the lower probability to be diagnosed at advanced stage.[15] Employment status related to better income, better access to medical services (as part of job benefit), and less risky behaviour due to lower psychological stress of being jobless.[25,26] If we analysed our data more detail, there are a number of reasons that could explain our findings. First, most of the unemployment subjects were fulltime housewives. Housewives, although classified into unemployed, usually is a voluntary choice who have the responsibility to look after the house and their family. It means that housewives are not the breadwinner of the family, thus most of family income come from other family members, and the employment status of housewives is not representing the socioeconomic status of the family which related to access to medical service.[25] Another possible explanation related to the type of employment. Different type of employment or occupation has different risk to be exposed by occupation or environment NPC related risk factors. Our data showed that most employed subjects were blue collar workers, peasants, and other manual type workers. Evidences from previous studies showed those individuals had higher risk to have NPC.[2,3,30]

Evidence from previous studies showed income level is the most robust socioeconomic indicator associated to health status.[12,28] Our data showed inconsistency between bivariate analysis results and multivariate analysis results. Result from bivariate analysis showed that subjects who had income level below poverty line had higher probability to be diagnosed at advanced stage, but it was not the case in multivariate analysis, although the result show the same tendency. It is well recognized that income influence health status primarily via material pathway. Income provide necessary resources such as better access to medical access, and general living material like housing which highly influence health status.[26,28] Lower income level will be a barrier for individual to access basic medical service such as prevention measure, screening, and other early detection method of cancer including NPC. It also influence health seeking behaviour of medical treatment when NPC clinical symptoms start to appear and disturb patient activities. Income also directly impact on the general living conditions. Lower income people have worse housing, highly risk to be exposed by

hazardous material such as chemical agents which increase the risk of having NPC.[10,15,27] In our different results between analyses, our plausible explanation is related to the sample size of the study. Although our sample has fulfilled minimum sample size, we believe since the variation of data was quite high, it would be more stable for the multivariate analysis to be conducted if the sample size was larger. It was also indicated by a wide confidence interval, which showed the heterogenity of the data due to small sample size.

Educational level is also robust socioeconomic predictor of health status. Individuals with higher educational level usually have better health status.[12,13] Education influences health status mainly through behaviour pathway. People with better education will have better knowledge, and have better awareness about their health status, practice healthy behaviour, and less engaged in risky behaviour. In NPC context, people with higher educational level will have more knowledge and awareness to avoid the exposure of NPC's risk factors, and try to access medical services earlier for their health complaints associated with NPC. Education also indirectly influences health status by providing opportunities for people to have higher occupation class. Higher occupation class correlate with better income, better job benefit such as health insurance coverage, thus will improve overall general living condition and medical access lead to better health status including early detection of NPC.[14,15,28] Again, we believe the difference in our findings between bivariate and multivariate analysis happened due to the small sample size.

Our finding related to health insurance status showed that the health insurance coverage did not increase the probability of the subjects to be diagnosed at early stage. This was contrary to the result from previous study. Health insurance coverage was an indicator of access to medical service. It was clearly explained, people who had insurance coverage had no financial barrier to access medical services, and should have better utilisation in medical services compared to the uninsured. Consequently, they would have better opportunity to get early treatment particularly in advanced medical conditions such NPC.[24,27] Detail analysis from our data revealed that health insurance status data collected after the diagnosis data had been taken. Therefore, most of the subjects had insurance coverage after they had been diagnosed, in order to cover their financial cost of NPC medical treatment. This phenomenon is common in health insurance field known as adverse selection. Only individuals who had high risk of health i.e. having chronic medical condition willing to join health insurance to cover their medical expenses. Indonesia's National Health Insurance (*Jaminan Kesehatan Nasional*) which just implemented in 2014 has suffered severe adverse selection due to lack of regulation enforcement related to compulsory participation in the program.

Based on our extensive literature search, our study was the first study in Indonesia which tried to explore the socioeconomic inequality related to stage at diagnosis of NPC patients. We admit several limitations in our study. The main concern was the relatively small sample size which could underestimate the strength of association when multivariate analysis was conducted. We believe our findings in bivariate analysis were valid and robust, because our sample size has been calculated based on the suitable formula. However, multivariate analysis usually require larger sample size in order to provide the best estimation. That was the main reason why our findings slightly different, although both bivariate and multivariate data showed similar tendency. Other limitation regarded to the detailed of data particularly in socioeconomic status measurement. Our data relatively measured in general due to difficulties in collecting primary data of income, occupation, and health insurance. This somehow, limited our effort to elaborate our findings further.

We conclude that socioeconomic status was associated with stage diagnosis of NPC levels. Socioeconomic inequality in stage at diagnosis of NPC patients did exist in Indonesia. Employment status was the strongest factor contributed to the probability of NPC patients to be diagnosed at advanced stage, while income level and educational level contributed also in lesser extent. Further study with larger sample size, and better design such as case-control or cohort study will be needed to firmly establish the relationship between socioeconomic status and stage at diagnosis of NPC patients.

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