ORIGINAL PAPER

The relationship between income, health insurance, and employment status as prognostic indicators of bladder cancer: A survival analysis

Wahjoe Djatisoesanto [1, 2], Yufi Aulia Azmi [1, 2, 3], Ida Bagus Gde Tirta Yoga Yatindra [1, 2]

[1] Department of Urology, Faculty of Medicine, Universitas Airlangga;
[2] Dr. Soetomo General-Academic Hospital, Surabaya, East Java, Indonesia;
[3] Department of Health Sciences, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.

Summary

Background: Bladder Cancer (BC) is one of the health problems. Socioeconomic status (SES) may correlate with patient treatment, possibly impacting patient prognosis. This study aimed to determine the relationship between income, health insurance, and employment status as prognostic indicators of BC.

Methods: A retrospective observational study for patients diagnosed with BC in a hospital during the 5-year period between January 2019 and December 2023. Kaplan-Meier test analysis was used to generate overall survival curves stratified by income, employment status, and health insurance. Multivariate Cox proportional-hazards regression was used to identify factors associated with worse overall survival.

Results: The results of the analysis on 219 patients showed no difference in patient survival based on income (p > 0.05), while employment status and health insurance showed significant difference in patient survival (p < 0.05). Moreover, there were 99 (45.2%) patients died, with the average patient being 58 years old and dominant in male patients.

Conclusions: Prevention of poor outcomes in patients needs to pay attention to certain characteristics, particularly for the low-economic patients without appropriate national health insurance coverage.

KEY WORDS: *Bladder cancer; Insurance; Outcomes; Income; Employment.*

INTRODUCTION

Bladder cancer (BC) is a neoplasm that arises from the bladder and is the most common type of urinary tract neoplasm (1). This cancer is included in one of the 10 most common cancers worldwide and has a high mortality rate (2). BC accounts for 3% of global cancer diagnoses and is particularly common in developed countries. This case is mainly found in people aged 55 years, who are found in as many as 90% of diagnoses, and the disease is four times more common in men than women (3). The incidence rate is twice as high in developing countries than in developed countries (1).

Treatment of bladder cancer tends to be significant and expensive (4). Diagnosis relies mainly on cystoscopy, an invasive and costly procedure. Most BCs are diagnosed at an early stage when they can be treated. However, about 25% of BCs are diagnosed at an advanced stage (2). The prognosis depends on many factors (1). SM survival varies significantly according to stage, in both non-invasive and invasive cases. The percentage of non-invasive cancers is relatively high. Stage, age, and histology associated with survival (5). The probability of accumulated survival at the end of 1, 3, 5, and 10 years in patients with BC is 0.8989, 0.7132, 0.5752, and 0.2459, respectively. There are significant differences in survival rates between age groups and types of treatment (6). The stage and extent of the cancer are important factors in determining the best treatment for BC (7).

Continuity Cancer survival is generally lower for residents of more socio-economically disadvantaged areas. Socio-economic inequality decreases survival due to certain factors (8). In addition, health insurance is the determinant of patient treatment. The burden of cancer survival also affects healthcare systems and society (9). In-hospital mortality can occur in patients with BC. The objective of this study was to determine the relationship between income, health insurance, and employment status as prognostic indicators of bladder cancer.

MATERIALS AND METHODS

Study design

The largest tertiary referral hospital in East Java, Indonesia, *Dr. Soetomo General Academic Hospital*, carried out a retrospective observational study for patients with bladder cancer. Hospitalized BC patients were the subject of the research, which ran for five years, from January 2019 to December 2023. Adult BC patients were included, and patients with missing data met the exclusion criteria. The *Dr. Soetomo General Academic Hospital's* ethical review board granted approval for the research, which was carried out under the Declaration of Helsinki (approval number: 1527/ LOE/ 301. 4. 2/ XI/ 2023).

Data collection

The following socioeconomic data were extracted for analysis: income, employment status, and health insurance. Patients were divided by income below 4 million Rupiah or more than 4 million Rupiah, according to the basic salary in

Indonesia. They were divided by type of health insurance as patients with *National Health Insurance (Jaminan Kesehatan Nasional/JKN)* or private insurance. Mortality in this insurance system was defined as death during the hospital stay.

Statistical analysis
Survival analysis was done for patients whose income, work status, and health insurance were known. Time in months from diagnosis to death from any cause was the primary outcome. For every variable, descriptive epidemiological and survival statistics were computed. The overall survival curves were stratified by income, job status, and health insurance using Kaplan-Meier test analysis. Log-rank tests were used to analyze survival differences. To find the variables linked to a lower overall survival rate, multivariate Cox proportional-hazards regression was used. *Hazard ratios* (HR) and accompanying 95% *confidence intervals* (CI) were utilized. We also analyzed the regression to predict sepsis and metastases as strata. The criterion for statistical significance was fixed at $P < 0.05$. The statistical studies were conducted using *IBM Corp.'s SPSS 25 program* in Armonk, NY.

RESULTS
There were 99 (45.2%) patients who died. Results show that the average patient is 58 years old with prevalence of male patients. Our analysis shows that the characteristics of income below 4 million rupiah and education level have significant impact in mortality rates.
Sociodemographic characteristics are shown in Table 1.
The results of the *socio-economic status* (SES) data assessment show that most patients have an income of more than 4 million rupiahs every month. More than half of the

Table 1.
Socioeconomic Status.

Component	N	%	P
Race			
Javanese	164	74.9	0.253
Madurese	50	22.8	
Chinese	5	2.3	
Income			
≥ 4 million rupiah	192	87.7	< 0.001
< 4 million rupiah	27	12.3	
Employment Status			
Yes	113	51.6	0.013
No	106	48.4	
Farmer			
Yes	21	10.6	0.002
No	198	89.4	
Location			
Urban	52	23.7	0.812
Rural	167	76.3	
Health Insurance			
National Insurance	174	79.5	0.827
Private Insurance	45	20.5	
Education			
Educated	177	80.8	< 0.001
Non-Educated	42	19.2	

respondents were employed. Most have health coverage. SES data are shown in Table 2. Based on the results of survival analysis using Kaplan Meier (Log-rank), there was no difference in patient survival based on income ($p > 0.05$) (Figure 1), while there was a difference in patient survival based on employment status and health insurance ($p < 0.05$) (Figures 2, 3).
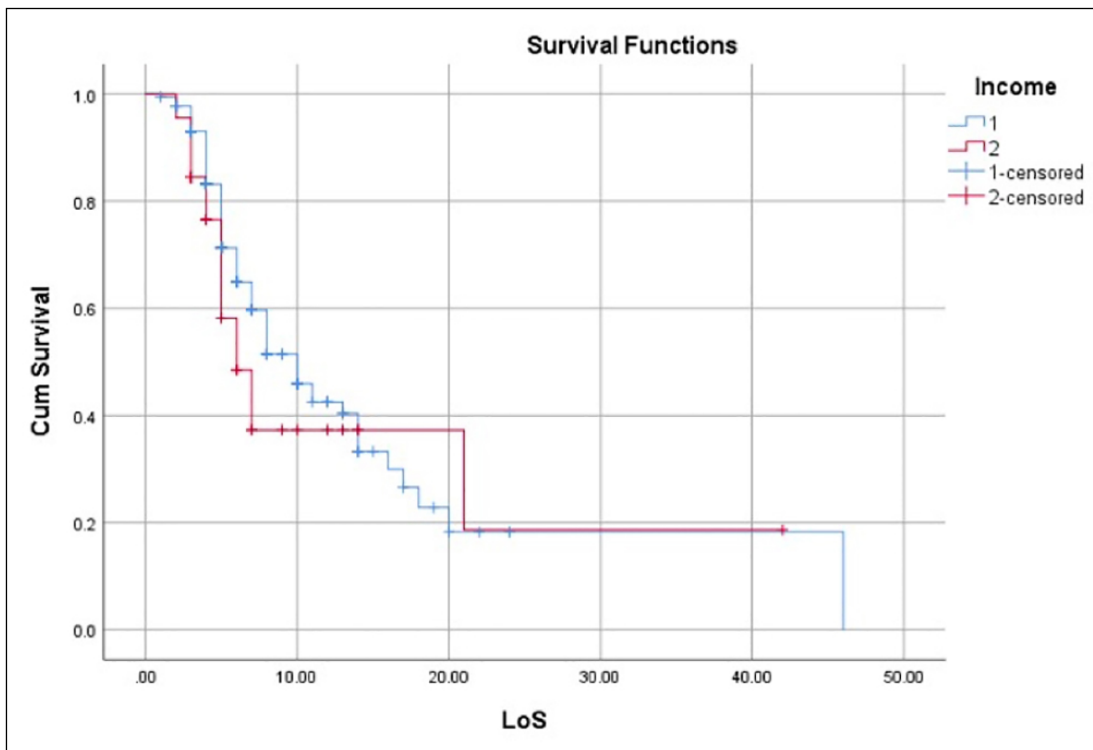

Figure 1.
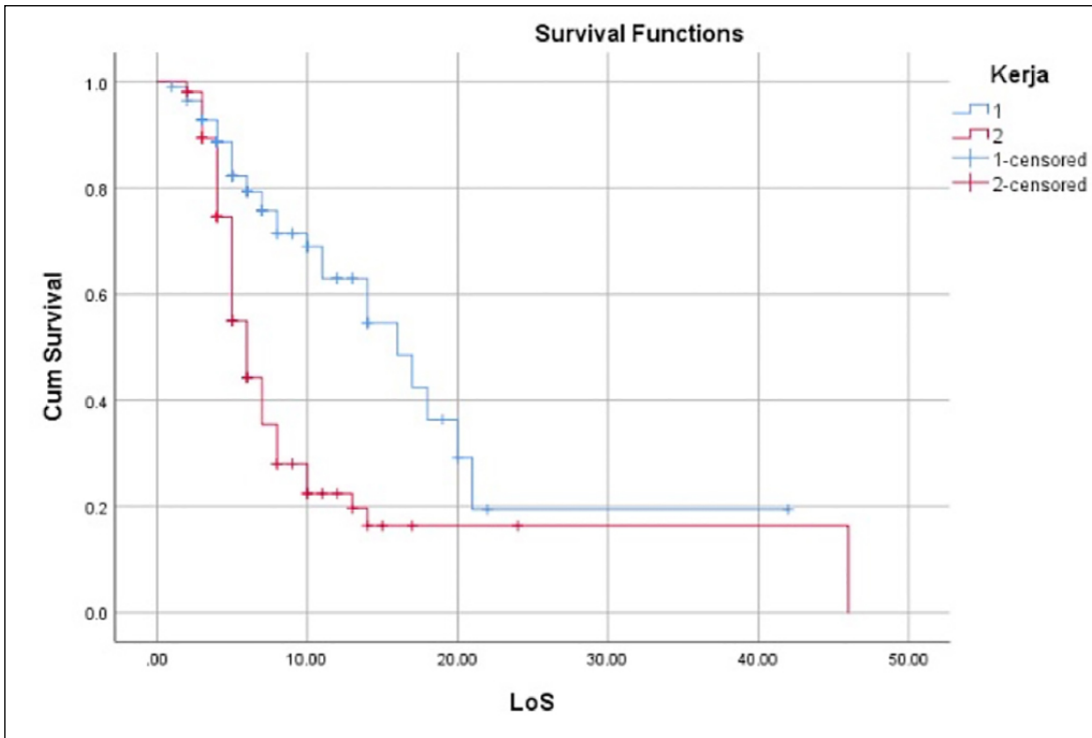*Survival analysis of bladder cancer patients with different income.*

Figure 2.
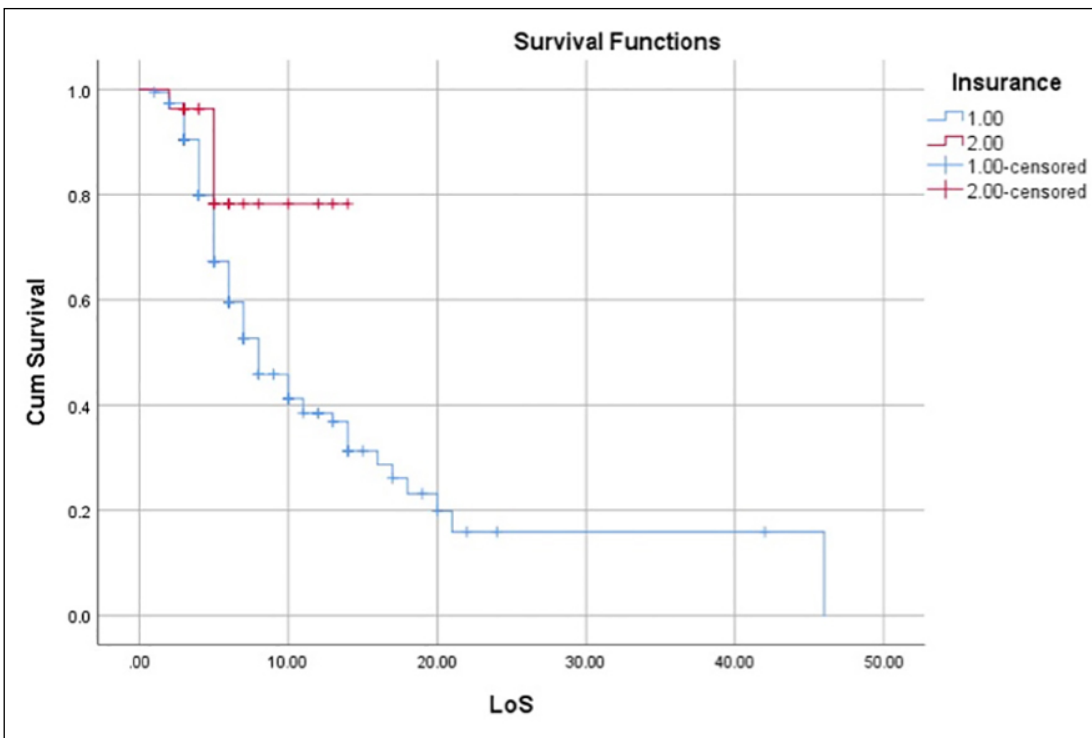*Survival analysis of bladder cancer patients with different employment status.*

Figure 3.
Survival analysis of bladder cancer patients within different health insurance.

DISCUSSION

The results showed that there was no difference in patient survival based on income, while, there were differences in patient survival based on employment status and health insurance. Previous research has found relationship between socioeconomic status and survival, although socioeconomic assessments were carried out with different standards (10). Other studies have found that cancer survival is often poorer among people from more socioeconomically disadvantaged areas. For tumors of connective/soft tissue, bladder, and unknown primary origin, socioeconomic differences in survival decrease with increasing age at diagnosis (8). In addition, health insurance is the determinant of patient treatment. Finally, the burden of cancer survival also affects healthcare systems and society (9).

Taylor et al. discovered that characteristics related with a greater chance of bladder cancer presenting at an advanced stage compared to early stages were race, ethnicity, gender, insurance status, one or more comorbidities, and a median household income of less than $63,000 (11). Other researchs have found that lower SES, Medicaid insurance, and no insurance all resulted in a higher tumor stage. Regardless of the stage of the tumor, poorer SES, having Medicaid insurance, and no insurance linked to worse *overall survival* (OS) and *disease specific survival* (DSS) (12).

Worse overall survival is related to male gender and significant prognostic factors of overall survival include gender (13). Other studies found that women's risk levels were significantly higher than men's for up to two years after a bladder cancer diagnosis, especially for muscle-invasive cancers. The common belief that the prognosis for bladder cancer is poorer in women compared to men must be reconsidered (14).

In Indonesia, *National Health Insurance* (NHI) significantly enhances public health and offers low-income households access to care. Nonetheless, NHI coverage below the federal minimum or the government's guidelines may affect health at all phases and developments. The growth and development of stunted children, immunization rates, and the quality of life for those with non-communicable illnesses may all be negatively impacted by low NHI coverage. Moreover, health insurance is less common among rural homes. The main criterion for eligibility for Indonesia's subsidized and contributory programs is that participants must be employed and live in Java or Bali. Low coverage may also be due to the cost of traveling to the health insurance office (15).

This burden should be evenly distributed across stakeholders considered in the evaluation of the cost-effectiveness of new anti-cancer drugs (9). Patient survival rates can be enhanced through strategic planning for early detection and screening, as well as proper access to appropriate diagnostic and treatment services, particularly in men, considering the significant influence on disease stage at diagnosis (16).

CONCLUSIONS

There is no difference in patient survival based on income, while there are differences in patient survival based on employment status and health insurance. Health insurance and employment status, specifically being a farmer, might affect the mortality outcomes significantly.

ETHICAL APPROVAL

The *Dr. Soetomo General Academic Hospital's* ethical review board grants approval for this research carried out under the Declaration of Helsinki (approval number: 1527/LOE/301. 4. 2/XI/ 2023).

REFERENCES

1. Kaseb H, NR. A. Bladder Cancer. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. 2023.

2. IARC. Bladder cancer. 2023; Available from: https://www.iarc.who.int/cancer-type/bladder-cancer/

3. Saginala K, Barsouk A, Aluru JS, et al. Epidemiology of Bladder Cancer. Med Sci. 2020; 8:15.

4. Cumberbatch MGK, Noon AP. EAU on behalf of the Young Academic Urologists- Urothelial Cancer Working party. Epidemiology, aetiology and screening of bladder cancer. Transl Androl Urol 2019; 8:5-11.

5. Ripoll J, Ramos M, Montaño J, et al. Cancer-specific survival by stage of bladder cancer and factors collected by Mallorca Cancer Registry associated to survival. BMC Cancer 2021; 21:676.

6. Rezaianzadeh A, Mohammadbeigi A, Mobaleghi J, Mohammadsalehi N. Survival analysis of patients with bladder cancer, life table approach. J Midlife Health. 2012; 3:88-92.

7. Bethesda (MD): National Cancer Institute (US). PDQ Cancer Information Summaries: Bladder Cancer Treatment: Patient Version. 2023; Available from: https://www.ncbi.nlm.nih.gov/books/NBK66044/

8. Afshar N, English DR, Blakely T, et al. Differences in cancer survival by area-level socio-economic disadvantage: A population-based study using cancer registry data. PLoS One 2020; 15:e0228551.

9. Michaeli JC, Boch T, Albers S, et al. Socio-economic burden of disease: Survivorship costs for bladder cancer. J Cancer Policy 2022; 32:100326.

10. Russell B, Häggström C, Holmberg L, et al. Systematic review of the association between socioeconomic status and bladder cancer survival with hospital type, comorbidities, and treatment delay as mediators. BJUI Compass. 2021; 2:140-58.

11. Taylor A, Gallegos JM, Verplancke K, et al. Socioeconomic factors associated with stages of bladder cancer at diagnosis: Analysis of the National Cancer Database. J Clin Oncol 2022; 40(16_suppl):e16531-e16531.

12. Nazemi A, Ghodoussipour S, Pearce S, et al. Socioeconomic and insurance status are independent prognostic indicators of higher disease stage and worse prognosis in bladder cancer. Urol Oncol Semin Orig Investig 2019; 37:784-90.

13. Fang W, Yang ZY, Chen TY, et al. Ethnicity and survival in bladder cancer: a population-based study based on the SEER database. J Transl Med 2020; 18:145.

14. Andreassen BK, Grimsrud TK, Haug ES. Bladder cancer survival: Women better off in the long run. Eur J Cancer 2018; 95:52-8.

15. Sukartini T, Arifin H, Kurniawati Y, et al. Factors Associated with National Health Insurance Coverage in Indonesia. F1000Res. 2021; 10:563.

16. Amiri M, Heshmatollah S, Esmaeilnasab N, et al. Survival rate of patients with bladder cancer and its related factors in Kurdistan Province (2013-2018): a population-based study. BMC Urol 2020; 20:1-9.

Correspondence

Wahjoe Djatisoesanto
wahjoe.djatisoesanto@fk.unair.ac.id

Yufi Aulia Azmi
y.aulia.azmi@umcg.nl, yufiazmi@gmail.com

Ida Bagus Gde Tirta Yoga Yatindra
tirtayogastudi@gmail.com

Department of Urology, Faculty of Medicine, Airlangga University, Soetomo General Academic Hospital
Jl. Mayjen Prof. Dr. Moestopo No.6-8, Surabaya, East Java, Indonesia, 60286