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Age characteristics in buli tumor patients at the General Hospital For The Jayapura Regional period 2017-2022

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Abstract

Purpose: Buli-buli tumors, also known as vesica urinaria (bladder) tumors, represent the second most common malignancy after prostate cancer and are found twice as often in men than in women. The most frequent clinical symptoms include painless hematuria and urinary tract complaints, such as frequency, urgency, and dysuria. According to the Global Cancer Incidence, Mortality, and Prevalence (GLOBOCAN) 2020 data, there were 573,000 cases of bladder tumors worldwide, accounting for approximately 3% of all new tumors. This study aims to identify and describe the epidemiological characteristics of patients with buli-buli tumors treated at Jayapura Hospital.

Research Methodology: This research used a descriptive method by analyzing secondary data from the medical records of patients diagnosed with buli-buli tumors at Jayapura Hospital between 2017 and 2022.

Results: The findings revealed 61 buli-buli tumors. The largest proportion was in patients aged >50 years (30 cases, 49.2%). The second largest group was 41–50 years with 24 cases (39.3%), followed by 31–40 years with five cases (8.2%), 20–30 years with one case (1.6%), and <20 years with one case (1.6%).

Conclusions: Bladder tumors at Jayapura Hospital are most frequently found in patients over 50 years of age, suggesting that increasing age is an important risk factor.

Limitations: This study is limited to retrospective secondary data from one hospital and may not fully represent the prevalence patterns in Papua or Indonesia as a whole.

Contribution: This study provides initial epidemiological evidence of bladder tumor cases in Jayapura, serving as a reference for health authorities, future research, and the development of strategies for early detection and prevention in Eastern Indonesia.

Keywords: *Buli-buli Tumor*

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1. Introduction

Buli-buli tumors, also known as vesica urinaria (bladder) tumors, are the second most common malignancy after prostate cancer. Bladder tumors affect twice as many men as they do women. The most common symptoms of bladder tumors include painless hematuria and associated urinary tract infections (frequency, urgency, and dysuria). Bladder tumors are often classified according to their stage (Sharma, Goswami, & Gupta, 2018). Bladder cancer is the eleventh most common malignancy worldwide and the eleventh most common cancer in men. Bladder cancer shows a male predominance with a sex ratio of 4:1 (Prisnamurti, Hendri, & Danurdoro, 2022)

Bladder cancer ranks as the ninth most common malignancy worldwide, contributing significantly to global morbidity and healthcare costs owing to its high recurrence and progression rates (Croitor et al., 2024). Each year, approximately 10 million individuals die from cancer (Djatisoesanto, Azmi, Yatindra, Mudjanarko, & Umijati, 2024).

Based on data from the Global Cancer Incidence Mortality and Prevalence (GLOBOCAN), there were 573,000 cases of malignant tumors or bladder cancer in 2020, which accounted for 3% of all new cancer cases worldwide. The risk of developing bladder cancer is approximately 1 in 28 for men and 1 in 91 for women. Bladder cancer is the second most common malignancy in the urogenital system, after prostate cancer. In Indonesia, 7,828 new cases were recorded in 2020, with a death rate of 3,885. In this study, the researchers aimed to determine the characteristics of tumors at Jayapura Regional Hospital buli age in buli tumor patients, which more often affects adults over 55 years of age. Occupations with a high risk of exposure to carcinogenic chemicals, such as rubber, textile, and dye factory workers, have a higher risk of developing buli tumors, as well as tribal origin, and the main complaints of coming to the hospital such as hematuria (blood in the urine), frequent urination, pain when urinating, pain in the lower back and after diagnosis, type of histopathology, and surgical treatment based on such as (Umbas et al., 2014).

Clinically, the main symptoms of bladder cancer include painless hematuria, dysuria, urgency, and increased frequency of urination. These symptoms often lead to a delayed diagnosis, as they are commonly mistaken for urinary tract infections (Babjuk et al., 2022). Contributing risk factors include smoking habits, occupational exposure to industrial chemicals (such as those in the rubber, textile, and dye industries), and genetic and environmental influences (Sanli et al., 2017). In addition, age distribution serves as an important indicator, with several studies showing that the incidence of bladder cancer increases significantly among individuals aged > 50 (Patel, Oh, & Galsky, 2020). Non-urothelial bladder cancer, specifically squamous cell cancer, has the lowest survival (Ab Kadir, Hairon, Yaacob, Ab Manan, & Ali, 2022). Age at diagnosis of bladder cancer was found to be a significant predictor of worse overall survival and bladder cancer-specific survival, even in an era with more effective therapies (Lin, Pan, Zhang, Ye, & Song, 2023).

Metabolic comorbidities and therapies may modulate the risk and outcomes. Diabetes mellitus has been associated with a modestly increased risk of bladder cancer and worse post-treatment survival in several analyses, although heterogeneity exists (Yan et al., 2021). Regarding medications, long-term cyclophosphamide exposure is linked to hemorrhagic cystitis and a dose-dependent increase in bladder cancer risk, a relationship supported by epidemiological and mechanistic data; uroprotection and exposure minimization are standard. The pioglitazone–bladder cancer signal remains controversial; recent systematic assessments report mixed findings, advising cautious interpretation and individualized risk–benefit considerations in diabetology–oncology decision-making (Baddam, Banka, Divity, Sandesara, & Vityala, 2024).

Bladder cancer is strongly associated with modifiable risk factors. Cigarette smoking remains the most critical determinant, responsible for nearly half of all emphysema cases. Tobacco smoke contains aromatic amines and other carcinogens that are excreted in urine, resulting in prolonged contact with the bladder epithelium (Cumberbatch et al., 2018). Occupational exposure to carcinogenic substances, particularly in the rubber, textile, dye, and chemical industries, further increases the risk, a trend especially relevant in developing regions with weaker occupational health protections. Genetic predispositions and environmental factors, including chronic inflammation of the urinary tract, also play a contributory role (Sanli et al., 2017).

From a pathological standpoint, bladder tumors exhibit considerable heterogeneity. They are broadly classified into non–muscle-invasive bladder cancer (NMIBC), comprising stages Ta, T1, and carcinoma in situ, and muscle-invasive bladder cancer (MIBC), which has a worse prognosis and requires aggressive treatment approaches (Babjuk et al., 2022). Therefore, histopathological evaluation is critical not only for accurate diagnosis but also for guiding treatment decisions, ranging from intravesical therapy to radical cystectomy. This age-related pattern reflects both cumulative exposure to carcinogens

and age-associated decline in DNA repair mechanisms in the body. The present study at Jayapura Regional Hospital is consistent with this global evidence, showing that the majority of patients were > 55 years of age. These findings underscore the importance of targeted awareness programs and early detection strategies in older populations.

Therefore, this study aimed to provide preliminary data on the characteristics of patients with bullous tumors, especially in Papua, at Jayapura Regional Hospital. The incidence and prevalence of bullous tumors in Indonesia is increasing, but there is no data on the characteristics of patients with bullous tumors, especially in Papua, at Jayapura Regional Hospital. Based on the above background, this study aimed to determine the characteristics of patients with biliary tumors based on age at Jayapura Hospital. In Papua, local epidemiological data remain scarce, and the present study provides essential baseline information. Geographical, occupational, and healthcare disparities in this region may contribute to variations in incidence, risk factor exposure, and outcomes compared with other provinces in Indonesia. Understanding these local patterns is crucial for formulating region-specific interventions, particularly public health campaigns focusing on smoking cessation, occupational safety, and early medical consultation for urinary symptoms.

2. Literature review

Bladder tumors, also known as vesica urinaria tumors, can present in various morphological forms, including papillary, non-invasive in situ, nodular (infiltrative), or mixed papillary–infiltrative types. They are considered the second most common malignancy of the urogenital tract after prostate carcinoma and occur approximately twice as frequently in men as in women (Jubber et al., 2023). This sex disparity has been attributed to differences in exposure to risk factors such as smoking, occupational carcinogens, and hormonal influences, with androgens believed to play a role in bladder carcinogenesis (Dobruch et al., 2016; Sanli et al., 2017). Bladder cancer is more likely to affect older people and men, and along with the growing and aging global population, the number of cancer-related deaths has dramatically increased, which can be attributed to its recurrence rate of up to 75% (Cai et al., 2020).

From an anatomical perspective, the bladder is a sac-like organ situated in the pelvic cavity, functioning as a reservoir for urine produced by the kidneys.(Anatomy of the Bladder). The bladder is an organ resembling a 'sac' in the pelvis that stores urine produced by the kidneys. Urine is drained into the bladder located in the pelvic area through tubes called ureters. The bladder is divided into several layers:

a. Epithelium: The transitional part of the epithelium from which cancer cells originate.
b. The lamina propria is the layer that lies beneath the epithelium.
c. The detrusor muscle, a thick, deep layer of muscle, consists of layers of thick, smooth muscle that form the muscular wall of the bladder.
d. Soft perivesical tissue is the outermost layer, consisting of fat, tissue, and blood vessels. The buli-buli itself consists of three layers of woven detrusor muscles. The longitudinal muscle is on the inside, the circular muscle is in the middle, and the outermost muscle is the longitudinal muscle. the outermost layer, which contains adipose tissue, connective tissue, and vasculature (Knowles & Hurst, 2015).

The bladder mucosa consists of transitional epithelial cells similar to those lining the renal pelvis, ureters, and posterior urethra. The two ureteral orifices and the internal urethral meatus form a triangular anatomical structure known as the trigone of the bladder. This region is clinically significant because of its embryological origin and role in facilitating efficient urine flow (Wein, 2020). The mucosa of the buli-buli consists of the same transitional cells as the mucosa of the renal pelvis, ureter, and posterior urethra. At the base of the buli-buli, the two ureteral estuaries and the meatus uretra internum form a triangle called the trigonum buli-buli.

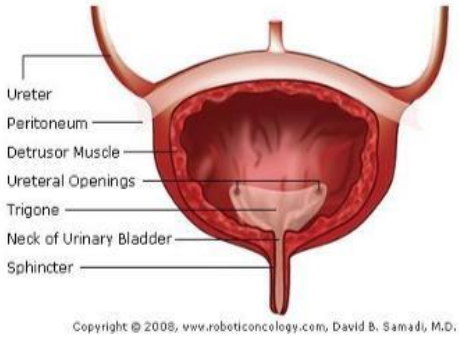

Figure .1 Anatomy of the Buli
Source: Chronic Kidney Desease Stage V with urinary tract infection (UTI) and Buli Tumor, 2019

Anatomically, the bladder has three primary surfaces: the **superior surface** adjacent to the peritoneum, **inferolateral surfaces**, and **posterior surface**. The superior surface is considered the **locus minoris resistentiae** or the weakest portion of the bladder wall, making it more vulnerable to pathological invasion (Babjuk et al., 2022). The bulb collects urine from the ureters and expels it through the urethra during micturition (urination). The buli-buli has a maximum capacity, which is approximately 300-450 ml. When empty, the bulb is located behind the pubic symphysis; when full, it is above the symphysis so that it can be palpated and percussed. A fully filled bulb stimulates the afferent nerves and activates the micturition center in the spinal cord S2-4. sacral segment. This will cause contraction of the detrusor , muscleopening of the bulbous neck, and relaxation of the urethral sphincter resulting in micturition (Patel et al., 2020)

Furthermore, the pathophysiology of bladder tumors is closely linked to the high turnover rate of the urothelium and its exposure to urinary carcinogens. Carcinogenic metabolites from tobacco smoke, aromatic amines, and industrial chemicals accumulate in urine, leading to prolonged exposure to the bladder lining. This mechanism partly explains the high incidence of bladder cancer among individuals with long-term smoking habits or occupational exposure to industries such as dye, rubber, and textiles (Cumberbatch et al., 2018). Bladder tumors, or **vesica** urinaria malignancies, represent a heterogeneous group of neoplasms that differ in morphology, biological behavior, and clinical outcomes. Histologically, they are predominantly urothelial carcinomas, although squamous cell carcinoma and adenocarcinoma can also occur, particularly in regions with chronic irritation or parasitic infections, such as schistosomiasis (Knowles & Hurst, 2015). Urothelial carcinoma accounts for over 90% of bladder cancers in Western countries, whereas squamous and glandular variants are more frequent in developing nations, reflecting differences in environmental exposure and endemic risk factors (Cumberbatch et al., 2018).

In terms of staging and prognosis, bladder tumors are divided into non–muscle-invasive bladder cancer (NMIBC) and muscle-invasive bladder cancer (MIBC). NMIBC, which includes Ta, T1, and carcinoma in situ (CIS), accounts for approximately 70–75% of new diagnoses. Although NMIBC generally has a better prognosis, it is associated with high recurrence rates, requiring long-term surveillance and intravesical therapy, such as Bacillus Calmette-Guérin (BCG) instillation (Babjuk et al., 2022). In contrast, MIBC is characterized by aggressive progression and a higher risk of metastasis, necessitating radical treatments, including cystectomy and systemic chemotherapy (Patel et al., 2020). From a molecular perspective, bladder carcinogenesis involves multiple genetic and epigenetic alterations. Frequent mutations include those in FGFR3, TP53, and RB1, which play critical roles in tumor initiation and progression. FGFR3 mutations are commonly associated with low-grade papillary tumors, whereas TP53 and RB1 alterations are more frequently observed in high-grade invasive cancers (Seiler et al., 2017). These molecular distinctions underline the biological heterogeneity of bladder tumors and open opportunities for targeted therapies, such as FGFR inhibitors, which are currently under clinical evaluation (Shah, Bauer-Nilsen, McNulty, & Vicini, 2020).

Bladder tumors are also influenced by environmental and lifestyle factors. Most bladder cancers can be traced back to exposure to environmental and occupational chemicals, the largest of which is tobacco smoke (Saginala et al., 2020). Smoking remains the most significant risk factor, accounting for nearly half of all bladder cancer cases. Carcinogens from tobacco are metabolized in the liver and excreted in the urine, leading to prolonged urothelial exposure (Cumberbatch et al., 2018). Occupational exposure to aromatic amines, common in the dye, textile, rubber, and chemical industries, also significantly increases the risk. Additionally, chronic bladder irritation, such as long-term catheterization or recurrent urinary tract infections, has been implicated in squamous metaplasia and tumorigenesis (Sanli et al., 2017).

Another important dimension is the age and sex distribution. The incidence of bladder cancer rises steeply after the age of 50 years, with the majority of patients diagnosed in their 60s and 70s. This trend may be explained by cumulative lifetime exposure to carcinogens and age-related decline in DNA repair mechanisms (Patel et al., 2020). Men are disproportionately affected compared to women, with a ratio of approximately 3:1, although women often present with more advanced disease and worse outcomes, possibly because of diagnostic delays (Dobruch et al., 2016). Clinically, the most common presenting symptom is painless hematuria, observed in up to 80% of cases. However, irritative voiding symptoms, such as frequency, urgency, and dysuria, are also frequent, especially in carcinoma in situ. Unfortunately, these symptoms are often misinterpreted as benign urinary tract infections, resulting in diagnostic delays and poor prognoses (Babjuk et al., 2022).

From a public health perspective, bladder tumors represent a considerable economic burden because of their high recurrence rate and lifelong surveillance requirements. Bladder cancer has one of the highest lifetime treatment costs per patient among all cancers, owing to repeated cystoscopies, imaging, and intravesical therapy (Richters, Aben, & Kiemeney, 2020). Therefore, prevention strategies, particularly smoking cessation, workplace safety regulations, and awareness campaigns, are crucial for reducing disease incidence. Regional studies in Papua and Indonesia are scarce. However, local environmental exposure, dietary patterns, and disparities in healthcare access may influence the incidence and outcomes. For instance, limited access to advanced diagnostic modalities and treatment facilities in Eastern Indonesia may contribute to delayed detection and increased mortality. This underscores the importance of hospital-based descriptive studies, such as the present study at Jayapura Regional Hospital, in providing baseline epidemiological data that can inform tailored prevention and management strategies.

Bladder cancer is a common urologic malignancy with marked geographic, sex, and age variation. Recent syntheses show that incidence rises steeply after age 50 and is consistently higher in men, reflecting cumulative carcinogen exposure and potential hormonal influences. Smoking remains the most important modifiable determinant globally, followed by occupational exposure to aromatic amines in dye, rubber, textile, and chemical industries; both risks are especially salient in settings with weaker occupational protections (Jubber et al., 2023). GLOBOCAN 2020 estimated 573,000 new bladder cancer cases worldwide (≈3% of all new cancers) and ~213,000 deaths, underscoring a persistent global burden that disproportionately affects older adults (Sung et al., 2021).

In Indonesia, bladder cancer contributes a smaller share of national incidence relative to high-income countries, yet remains clinically significant and likely undercaptured where cancer registries are evolving. Fact sheets from IARC highlight the country's site-specific incidence profile and the limits of modeled estimates, pointing to the need for stronger local data systems. Hospital-based evidence complements this gap: a five-year Indonesian tertiary-center study reported high in-hospital mortality and identified irregular follow-up, metastasis, type-2 diabetes, and receipt of radiotherapy as independent mortality risk factors—signals that health-system and comorbidity factors importantly shape outcomes beyond tumor biology (Djatisoesanto et al., 2024). Similar Javanese-center data detail patient characteristics and care patterns, reinforcing the value of descriptive hospital cohorts for service planning (Prisnamurti et al., 2022).

From a clinicopathologic lens, most cases are urothelial carcinomas stratified into non–muscle-invasive bladder cancer (NMIBC: Ta, T1, CIS) and muscle-invasive bladder cancer (MIBC). NMIBC comprises ~70–75% of diagnoses but is notable for high recurrence and the need for long-term cystoscopic surveillance and intravesical therapy. Updated EAU guidance emphasizes risk-adapted follow-up, early intravesical chemotherapy, and adjuvant BCG for appropriate risk groups to curb recurrence and progression. These care imperatives translate into substantial lifetime costs and service demands, particularly where endoscopic capacity is constrained.

Risk-factor mapping has expanded beyond tobacco and workplace carcinogens to include environmental exposures and metabolic comorbidities. Contemporary reviews reaffirm smoking as accountable for up to half of cases in some populations, with risk scaling to intensity and duration, while occupational aromatic amines remain relevant in industrializing economies (Jubber et al., 2023). The Indonesian tertiary-center cohort's association of diabetes with mortality aligns with broader oncology literature linking metabolic disease to worse bladder cancer outcomes, and suggests the importance of integrated NCD-oncology management

Modifiable risks dominate the causal landscape. Cigarette smoking remains the single most important determinant, responsible for a large share of cases via urinary excretion of aromatic amines that chronically bathe the urothelium; risk scales with intensity and duration of exposure (Cumberbatch et al., 2018; Saginala et al., 2020). Occupational exposures—notably in the dye, rubber, textile, and chemical sectors—additively elevate risk, a salient concern in developing settings where enforcement of industrial hygiene can be inconsistent (Cumberbatch et al., 2018). Environmental and inflammatory contributors (e.g., chronic infections/irritation) further modulate susceptibility (Sanli et al., 2017).

Clinical presentation is classically painless hematuria, with irritative voiding symptoms (urgency, frequency, dysuria) common in CIS—but frequently misattributed to benign urinary tract infection, delaying referral and definitive cystoscopic evaluation (Babjuk et al., 2022). Such delays are particularly consequential in resource-limited regions where access to endoscopy, pathology, and intravesical agents may be constrained—amplifying the importance of hematuria-aware primary care pathways and clear referral criteria (Babjuk et al., 2022; Richters et al., 2020). Beyond exposure risks, comorbidities shape outcomes. Age at diagnosis independently predicts worse overall and cancer-specific survival, even with modern therapies (Lin et al., 2023). Emerging evidence links metabolic conditions (e.g., diabetes mellitus) and certain therapies (e.g., cyclophosphamide) to elevated risk and poorer prognosis, warranting integrated non-communicable disease–oncology management strategies in health systems (Patel et al., 2020). Meanwhile, the debated association between pioglitazone and bladder cancer illustrates the need for nuanced, individualized risk–benefit discussions in clinical practice.

From a systems perspective, bladder cancer imposes one of the highest lifetime costs per patient among solid tumors due to recurrent cystoscopy, imaging, and intravesical therapy (Richters et al., 2020). In regions like Papua/Eastern Indonesia, where epidemiological datasets remain limited and access heterogeneity is pronounced, hospital-based descriptive studies provide indispensable baseline signals for planning: prioritizing tobacco control, occupational health enforcement, timely hematuria work-ups, and risk-adapted surveillance for NMIBC within feasible care models (Babjuk et al., 2022; Prisnamurti et al., 2022). Taken together, the literature converges on several implications directly relevant to the Jayapura cohort: (i) concentration of cases in older adults, (ii) the need to treat hematuria as a red-flag requiring prompt cystoscopic evaluation, (iii) targeted prevention (smoking cessation, workplace protections), and (iv) pragmatic follow-up pathways to manage NMIBC's recurrence burden. These priorities align with international guidance yet must be localized to address regional diagnostic capacity and patient adherence challenges (Babjuk et al., 2022; Sung et al., 2021).

Epidemiologically, age is a central organizing variable: later-life incidence reflects cumulative mutagenic exposure and diminished DNA repair capacity, and older diagnostic age independently predicts worse overall and disease-specific survival even amidst therapeutic advances (Jubber et al., 2023). Cross-national trend analyses further show heterogeneity by development level and HDI strata,

with many Asian settings experiencing rising case counts due to population aging and improved detection. Updated global estimates for 2022 confirm continuing increases in absolute case numbers attributable to demographic change, reinforcing the salience of age-focused screening awareness (e.g., evaluation of painless hematuria) in primary care.

For Papua and Eastern Indonesia, peer-reviewed population data are scarce; therefore, hospital-based retrospective profiles—like the present Jayapura series—provide essential baseline signals on age distribution and service needs. These data can inform pragmatic priorities: tobacco control, occupational health enforcement, timely hematuria workups, and structured surveillance pathways for NMIBC within resource-appropriate models of care. The convergence between local hospital trends and international epidemiology strengthens the external validity of focusing preventive and diagnostic efforts on men over 50 and workers with chemical exposures, while also addressing adherence to follow-up to mitigate mortality risks identified locally (Djatisoesanto et al., 2024).

3. Research methodology

This study used secondary data in the form of medical records from Jayapura City Regional Hospital. Data were collected from medical records from 2017-2022 to obtain a description of the characteristics of patients with Buli Tumors at Jayapura Regional General Hospital. In this study, the data analysis used was univariate analysis used to explain or describe the number or value of patient characteristics with the technique of total sampling from medical records at Jayapura Regional General Hospital in 2017-2022 there were 61 patients with Buli Tumor. The use of secondary hospital data is appropriate in epidemiological studies, as it allows for efficient extraction of demographic and clinical patterns without subjecting patients to additional procedures (Richters et al., 2020). The population comprised all patients diagnosed with bladder (buli) tumors during the five-year period, and the sampling technique used was total sampling, which ensures that all eligible cases are included, thereby minimizing selection bias (Masturoh & Anggita, 2018).

Data collection focused on age distribution, which serves as a critical epidemiological variable in bladder cancer research, given that incidence and prognosis are strongly age-dependent (Lin et al., 2023). Additional variables typically assessed in similar studies—such as sex, occupation, risk factors, and histopathological type—were limited in this dataset; thus, the analysis concentrated primarily on age characteristics. All data were coded and tabulated using Microsoft Excel, followed by descriptive statistical analysis, which summarized frequencies and percentages of cases by age groups. Descriptive statistics are particularly useful in hospital-based epidemiological reports where the goal is to describe, rather than generalize, findings to a larger population (Saginala et al., 2020).

The analysis applied univariate methods, as the intent was to describe the epidemiological profile rather than establish causal relationships. Univariate descriptive statistics have been widely used in cancer registry-based studies, especially in low-resource settings, to provide baseline epidemiological evidence (Djatisoesanto et al., 2024). Furthermore, retrospective study designs using hospital data are a practical and widely adopted approach in urologic oncology research, particularly in contexts where population-level cancer registries remain underdeveloped (Prisnamurti et al., 2022). Ethical considerations were addressed by maintaining the confidentiality of patient identities, consistent with international standards for retrospective medical record studies (Ajami et al., 2021). Although the study did not involve direct patient contact, secondary data research still necessitates responsible handling to ensure privacy and compliance with institutional regulations.

3.1 Analysis Methods

Using a descriptive statistical analysis. Descriptive statistical analysis is used to analyze data by describing the collected data as it is without intending to make conclusions that apply to the public or generalizations (Masturoh & Anggita, 2018). The analysis of this study applied a descriptive statistical approach to characterize the epidemiological profile of bladder (buli) tumor patients treated at Jayapura Regional General Hospital between 2017 and 2022. Descriptive statistics were deemed the most appropriate technique given the retrospective and hospital-based nature of the data, which aimed to summarize patient characteristics without inferring causality or generalizing beyond the observed cases

(Masturoh & Anggita, 2018). The data collected from medical records were first verified for completeness and consistency, followed by coding and tabulation into defined age categories (<20, 20–30, 31–40, 41–50, and >50 years).

In epidemiological cancer studies, descriptive methods are widely adopted to provide baseline information about incidence, demographic distribution, and risk stratification (Richters et al., 2020). Thus, frequency distributions and percentage values were calculated to illustrate the proportion of cases across different age groups. This approach allows for a straightforward interpretation of trends, such as the predominance of cases in patients above 50 years, which is consistent with global epidemiological data (Lin et al., 2023). To ensure data accuracy, all medical records were cross-checked, and cases with incomplete age information were excluded from the analysis. The total sample size comprised 61 patients, which aligns with the total sampling technique used in this study. Total sampling is advantageous in rare diseases, such as bladder tumors in specific regions like Papua, because it maximizes the dataset and avoids sampling bias (Saginala et al., 2020).

The statistical analysis proceeded in several steps:

1) **Data Cleaning and Coding**
   Each patient record was anonymized to maintain confidentiality. Age was categorized into intervals, and frequencies were computed. This ensured uniformity in reporting and minimized potential errors arising from heterogeneous data entry.
2) **Descriptive Summarization**
   The primary statistical outputs were simple frequency counts and proportions. This allowed for the identification of trends, such as which age group bore the highest burden of the disease. Descriptive statistics are especially relevant in regions where advanced statistical modeling may be constrained by small sample sizes or incomplete datasets (Prisnamurti et al., 2022).
3) **Comparative Descriptive Analysis**
   The results from Jayapura were compared against national data from Indonesia and international findings, particularly the GLOBOCAN 2020 database. Such comparative analysis strengthens the external validity of findings, even though this study is hospital-based (Sung et al., 2021).
4) **Presentation of Results**
   Data were tabulated and graphically represented to enhance clarity. Age distribution was reported in both absolute numbers and percentages, as this dual approach is recommended in epidemiological reporting for ease of interpretation across disciplines (Babjuk et al., 2022).

The use of descriptive statistical analysis also aligns with methodologies in other hospital-based cancer studies in developing countries, where the primary goal is to provide context-specific evidence that can inform regional health policies, awareness campaigns, and preventive interventions (Djatisoesanto et al., 2024). Although inferential statistics or regression modeling could provide further insights into associations between risk factors and outcomes, the limited scope of variables available in this dataset made descriptive statistics the most suitable and valid option.

4. Results and discussions

Based on data obtained using total sampling from medical records at Jayapura Regional General Hospital from to 2017-2022 there were 61 patients with Buli tumors. The data that can be obtained include age. Based on age group, the distribution of biliary tumors at Jayapura Regional General Hospital between 2017-2022 was as follows:

Tabel 1. Distribution of Buli Tumor Patients Based on Age

Age (Years)	Number of Patients	(%)
< 20 years	1	1,6 %
20-30 years	1	1,6 %
31-40 years	5	8,2 %
41-50 years	24	39,3 %
> 50 years	30	49,2 %

Total	61	100

Source: Data processed in 2024.

Based on the data above, it can be seen that the distribution of buli tumor patients based on the largest age is the age group> 50 years as many as 30 patients with a percentage of 49.2%, 2%, the followed by the age age group group 41-50 years as many as 24 patients with a successively percentage of total of 39.3% and the third highest to the lowest includes the 31 40 a 5 patients patient patient with a with a percentage of 8. age group 20-30 a total of of a total of 1, with a percentage of 1.6%, and the age group of < 20 years had 1 (1.6 %). These findings confirm that age is a major risk factor for bladder tumor development. The predominance of cases among patients aged > 50 years is consistent with global data, indicating that bladder cancer is primarily a disease of older adults. According to Patel et al. (2020), the incidence of bladder cancer increases significantly after the fifth decade of life owing to cumulative exposure to carcinogens, age-related decline in immune function, and reduced DNA repair capacity. This explains why nearly 90% of the cases in this study were in patients aged > 40 years.

These results also align with the GLOBOCAN 2020 statistics, which reported approximately 573,000 new bladder cancer cases worldwide, with the majority affecting individuals above the age of 55 (Sung et al., 2021). In Indonesia, 7,828 new cases and 3,885 deaths were recorded in 2020, reflecting both rising incidence and high mortality rates (Sung et al., 2021). Although the Jayapura data are more limited in scope, they mirror these national and global trends, emphasizing the urgent need for early detection strategies in older populations. From a clinical perspective, most patients present with painless hematuria, which remains the most common initial symptom of bladder tumors. However, as Babjuk et al. (2022) noted, such symptoms are often misinterpreted as urinary tract infections, contributing to diagnostic delays and the risk of advanced disease presentation. This highlights the importance of raising awareness among healthcare providers and patients in Papua about hematuria as a red-flag symptom.

This study also highlights the occupational and environmental risk factors associated with bladder cancer. Workers in the rubber, textile, and dye industries are exposed to aromatic amines and other carcinogens, which significantly increases their risk (Cumberbatch et al., 2018). Although occupational history was not comprehensively assessed in this dataset, the relevance of such factors in Papua, where industrial safety monitoring may be limited, cannot be ignored. Therefore, public health interventions, including workplace safety campaigns and routine medical screenings for high-risk workers, should be prioritized. Another important dimension is the sex disparity in bladder cancer incidence, with men being affected approximately twice as often as women (Ajami et al., 2021). Although this study did not present gender-specific data in detail, international evidence attributes this disparity to higher smoking prevalence and occupational exposure among men, as well as potential hormonal influences (Dobruch et al., 2016). Future studies in Papua should incorporate sex-specific analyses to better understand these trends in the local context.

From a clinical perspective, the predominance of older patients suggests that early warning and screening strategies should be focused on high-risk age groups. As noted by Babjuk et al. (2022), painless hematuria remains the most common initial symptom, yet it is often misdiagnosed as urinary tract infection, contributing to diagnostic delays. This issue is particularly critical in Papua, where limited healthcare infrastructure and diagnostic capacity may exacerbate delays in cancer detection. Raising awareness among healthcare workers and communities regarding hematuria as a red-flag symptom is essential to improve early diagnosis.

In addition to age, other risk factors, such as smoking and occupational exposure to carcinogens in industries like rubber, dye, and textiles, are well-established contributors to bladder cancer (Cumberbatch et al., 2018). Although occupational history was not captured in this study, such exposures may still be relevant in Papua, especially in workers engaged in informal or unregulated sectors where chemical exposure is common. Future research in the region should incorporate socioeconomic, occupational, and lifestyle variables to better understand local determinants of bladder cancer. Furthermore, the predominance of cases in men, as reported in national and international data,

suggests a gender disparity that warrants attention. Men are typically more affected, with a ratio of approximately 3–4:1 compared to women, due to higher smoking prevalence, occupational risks, and possibly hormonal influences (Dobruch et al., 2016). While this study did not stratify patients by gender in detail, integrating sex-based analysis in future studies would enhance the explanatory value of regional epidemiology.

From a public health standpoint, the findings highlight the urgent need for region-specific cancer control strategies in Eastern Indonesia. Unlike major hospitals in Java, facilities in Papua may face greater challenges in ensuring timely cystoscopy, histopathological diagnosis, and long-term surveillance. The high recurrence rates associated with bladder cancer (up to 75% in non–muscle-invasive cases) imply significant treatment and follow-up demands, which can be financially and logistically burdensome in low-resource settings (Cai et al., 2020). Addressing these gaps requires strengthening referral systems, expanding diagnostic capacity, and implementing affordable surveillance strategies adapted to local realities.

In summary, the findings of this study strengthen the evidence that bladder tumors in Papua share epidemiological characteristics similar to those reported in national and global data, particularly regarding age distribution and clinical presentation. However, the lack of comprehensive regional data highlights the importance of continuing hospital-based and population-based studies. Strengthening awareness, improving diagnostic pathways for hematuria, and implementing occupational safety measures are essential steps to reduce the burden of bladder cancer in Papua and Indonesia. The results confirm that bladder tumors in Jayapura are most common among older adults, consistent with international epidemiological patterns. However, the local healthcare disparities may exacerbate diagnostic delays and mortality risks. These findings serve as a baseline reference for policymakers and clinicians to prioritize awareness campaigns, occupational health interventions, and improved diagnostic infrastructure in Papua. Further studies incorporating lifestyle, occupational, and gender-specific variables will provide a more comprehensive picture of bladder cancer epidemiology in Eastern Indonesia.

5. Conclusion

Based on research on the characteristics of Buli at Jayapura Hospital Tumor patients in 2017–2022, there were 61 patients included in the study. The following conclusions can be drawn: The majority of patients with Buli tumors were > 50 years of age (30 patients, 49.2%), followed by the age group 41-50 years as many as 24 patients, 39.3%). The third highest to the lowest include the group 31-40 5 patients, 8.2%, the age group 20-30 a total of of age group (1 patient, 1.6%), and the Another important conclusion is that the age-specific distribution in Papua aligns with the international data reported by GLOBOCAN, which highlights the growing incidence of bladder tumors worldwide, with men being disproportionately affected (Sung et al., 2021). The fact that the majority of cases are concentrated in older adults underscores the role of preventive strategies, such as smoking cessation programs, occupational safety for workers exposed to industrial chemicals, and routine screening for individuals with urinary symptoms (Cumberbatch et al., 2018).

Moreover, this study emphasizes the urgent need for local epidemiological databases in Papua and other regions of Eastern Indonesia. Nationally, bladder cancer cases have been increasing, with over 7,800 new cases and nearly 4,000 deaths reported in 2020 (Sung et al., 2021). However, regional disparities in access to diagnosis and treatment mean that delayed presentation and more advanced disease stages are common in under-resourced settings such as the Philippines. This study provides essential baseline data for clinicians and policymakers to design context-specific interventions. Finally, while the present research confirms that age is the dominant demographic characteristic among patients, other variables such as occupational exposure, lifestyle behaviors, and tribal/ethnic differences warrant further studies. Future research should incorporate larger sample sizes, multicenter collaborations, and molecular profiling to better understand the epidemiology of bladder tumors in Indonesia. Such efforts can enhance evidence-based policy-making, improve clinical management, and ultimately reduce the burden of bladder cancer in vulnerable populations.

This study concludes that bladder (buli) tumors at Jayapura Regional General Hospital during 2017–2022 were predominantly found in older patients, particularly those above 50 years of age, representing nearly half of all cases. The second largest proportion was observed among patients aged 41–50 years. These findings reinforce that age is a major epidemiological determinant of bladder cancer, consistent with both national and international data. The age-specific distribution highlights the role of cumulative exposure to carcinogens, lifestyle factors, and age-related decline in DNA repair and immune capacity. The results align with GLOBOCAN and Indonesian cancer registry data, suggesting that the regional trends in Papua reflect global patterns while also revealing unique challenges related to delayed diagnosis, healthcare disparities, and limited access to specialized oncology services. This hospital-based evidence therefore provides an essential foundation for strengthening local epidemiological data and guiding future cancer control strategies in Eastern Indonesia.

5.1 Suggestions

Conducting counseling in the community to increase knowledge about risk factors in patients with buli tumors and any data on buli tumors is expected from the Health Institution to recap all data on the characteristics of patients with buli tumors to make it easier for researchers to examine cases of and other disease characteristics. Public health campaigns are urgently needed to improve community knowledge of bladder tumor risk factors, particularly among high-risk groups such as men over the age of 50, smokers, and workers in industries with chemical exposure. Educational programs should emphasize early warning signs, such as painless hematuria and urinary complaints, which are often misdiagnosed as simple urinary tract infections. Health institutions in Papua, especially at the regional hospital level, should implement early detection protocols for individuals presenting with hematuria or recurrent urinary symptoms. Urinalysis, cytology, and cystoscopy should be encouraged in high-risk patients to reduce delays in diagnosis and improve survival outcomes.

Public health campaigns should prioritize increasing community knowledge about bladder cancer risk factors, especially among high-risk groups such as men over 50 years of age, smokers, and workers exposed to industrial chemicals. Educational programs should emphasize early warning symptoms like painless hematuria and irritative urinary complaints, which are often misdiagnosed as urinary tract infections. Considering the strong association between bladder cancer and occupational exposure, regulatory frameworks for workplace safety should be reinforced. Industries with high chemical exposure risks must adopt stricter protective measures and routine health screenings for their workers.

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