Epidemiological Prevalence and Molecular Markers of Bladder Cancer in Bangladeshi Women Aged 50-59: The Role of Tobacco Exposure and Awareness Deficits

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Authors' contributions

This work was carried out in collaboration among all authors. Author SI designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the research. Author SA managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Bladder cancer represents a significant health concern worldwide. However, comprehensive studies on its epidemiological trends, molecular characteristics, and associated factors among Bangladeshi women have been scarce.
Methods: A sample of 1984 women was analyzed to assess epidemiological trends and molecular insights into bladder cancer. The study objectives encompassed epidemiological analysis, molecular characterization, risk factor assessment, quality of diagnosis and treatment evaluation,

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and exploration of educational and awareness initiatives. Sampling techniques involved stratified random sampling, ensuring representation across diverse demographic backgrounds.

Results: The age group 50-59 showed heightened bladder cancer prevalence. Molecular characterization highlighted the dominance of FGFR3 gene mutations, while a significant subset exhibited TP53 mutations. Tobacco smoke emerged as a primary risk factor. Although patient satisfaction concerning diagnosis and treatment was relatively high, there existed a noticeable lack of awareness regarding bladder cancer symptoms among the participants.

Conclusion: The study underscores the need for targeted awareness campaigns, enhanced early screening, and research-driven clinical interventions tailored for Bangladeshi women. The identified molecular markers also suggest opportunities for personalized therapeutic strategies. The findings call for a comprehensive approach in the healthcare sector to effectively tackle bladder cancer challenges among women in Bangladesh.

1. INTRODUCTION

Overactive bladder (OAB) is a urological condition characterized by symptoms including urgency, frequent urination, nocturia, and, in some cases, urge incontinence [1]. Despite its relatively common occurrence, it often remains underdiagnosed and undertreated, with many patients reluctant to seek medical advice due to embarrassment, cultural beliefs, or lack of awareness [2,3]. Worldwide, the prevalence of OAB varies, ranging from 12% to 30% in women [4]. It is of particular interest to note the disparities in its occurrence among different populations, largely influenced by genetics, diet, lifestyle, and awareness of the condition. While substantial studies have been conducted in Western populations [5], Asian cohorts, and especially those in South Asian regions like Bangladesh, remain relatively under-researched. Bangladesh, with its unique demographic and socio-cultural dynamics, presents a different landscape for medical conditions and their impact on quality of life. Women in Bangladesh, a significant proportion of the population, face numerous challenges related to healthcare access and socio-cultural barriers [6,7]. These factors may influence both the prevalence and perception of conditions such as OAB, emphasizing the need for comprehensive and localized research. Furthermore, the impact of OAB on quality of life is profound. Women suffering from OAB often report decreased social interactions, disturbed sleep, reduced work productivity, and heightened psychological stress [8]. While these impacts have been documented in diverse settings, they are yet to be detailed in the context of Bangladeshi women. Moreover, understanding the risk factors specific to this population can greatly influence management and preventive strategies, hence benefiting a significant number of affected individuals. Given these considerations, this study aims to offer a comprehensive investigation into the prevalence, risk factors, and the quality of life impacts of overactive bladder in Bangladeshi women. Such insights are paramount in tailoring effective interventions and policies, ultimately fostering better urological health in the region.

1.1 Objectives

In our comprehensive analysis we have delineated a set of objectives to offer an integrative understanding of bladder cancer in this demographic. Firstly, we aim to conduct a thorough Epidemiological Analysis to discern the prevalence, incidence, and demographic variances linked to bladder cancer over recent decades. This will be followed by Molecular Characterization to pinpoint prevalent genetic and molecular markers, shedding light on potential unique genetic nuances in Bangladeshi women. Concurrently, an Assessment of Risk Factors, encompassing environmental, lifestyle, and genetic determinants, will be conducted to ascertain correlations with bladder cancer incidence. Furthermore, we seek to evaluate the Quality of Diagnosis and Treatment currently accessible, determining the efficacy of diagnostic methodologies and the overarching treatment landscape, emphasizing potential barriers to optimal care. Lastly, our objectives encompass an evaluation of Educational and Awareness Initiatives, ascertaining the present state of awareness and the impact of ongoing campaigns aimed at early detection and effective treatment. Through these objectives, our study intends to bridge epidemiological data with molecular insights, furnishing a holistic understanding of

bladder cancer's landscape among Bangladeshi women.

2. METHODS

2.1 Study Design, Sampling Technique, and Sample Size

A mixed-methods, cross-sectional study was conducted with an emphasis on both quantitative epidemiological data and qualitative molecular characterization. This research spanned from January 2022 to January 2023, encompassing urban and rural regions across Bangladesh to ensure a comprehensive representation of the population. A stratified random sampling method was employed. Bangladesh was divided into seven administrative divisions, and within each division, urban and rural areas were identified. Proportional allocation was then used to determine the number of participants from each area, ensuring that the sample is representative of the overall population's distribution. Women aged 18 years and above, with a history or current diagnosis of bladder cancer, were eligible to participate. A total of 1984 women were included in the study, ensuring a robust statistical power and allowing for in-depth molecular characterization.

2.2 Variables

- Dependent variables: Prevalence of bladder cancer, molecular markers identified in bladder cancer tissue, quality of received treatments, awareness levels.
- Independent variables: Age, socioeconomic status, geographic location, environmental exposures, lifestyle habits, genetic predispositions.

2.3 Statistical Analysis

Descriptive statistics, including means and standard deviations for continuous variables and frequencies for categorical variables, were utilized. The prevalence of bladder cancer was computed with 95% confidence intervals. Associations between independent and dependent variables were assessed using chi-square tests for categorical variables and t-tests for continuous variables. A multivariate logistic regression model was applied to determine the predictors of bladder cancer among the participants. All statistical analyses were performed using SPSS version 27, and a p-value < 0.05 was considered statistically significant.

3. RESULTS

Table 1 presents an in-depth and multi-faceted understanding of the bladder cancer landscape among Bangladeshi women. The age-specific prevalence underscores a notably higher incidence of bladder cancer in the 50-59 age bracket, suggesting that age might play a crucial role in the onset or diagnosis of the disease in this population. Furthermore, the molecular characterization reveals a dominant presence of FGFR3 gene mutations in the sampled tissues, emphasizing potential genetic predispositions or common environmental triggers that might lead to these specific mutations.

The data concerning tobacco smoke exposure underscores its significant association with bladder cancer among the respondents, reinforcing global research linking tobacco consumption and second-hand smoke exposure to bladder carcinogenesis. Satisfaction levels concerning diagnosis and treatment seem fairly positive, but there is still room for improvements, especially in early diagnosis. However, the most concerning insight emerges from the awareness levels, with an alarmingly high percentage of participants being unaware of bladder cancer symptoms prior to their diagnosis. The limited exposure to educational campaigns suggests an urgent need for heightened awareness initiatives in the country.

4. DISCUSSION

The findings from our study elucidate several crucial facets regarding bladder cancer among women in Bangladesh. One of the most significant observations is the heightened prevalence of bladder cancer in the age group of 50-59 years. This age-specific prevalence corresponds with global data suggesting an increased risk of bladder cancer as individuals age [9]. The reasons behind this increase in prevalence might be multifaceted, encompassing genetic, environmental, and lifestyle-related factors. Molecular characterization reveals a predominant occurrence of FGFR3 gene mutations. Such mutations have been consistently linked with non-muscle invasive bladder cancers and are often considered an early event in urothelial carcinogenesis [10]. The presence of TP53 mutations in a significant subset underscores the need for advanced therapeutic interventions, given the association of TP53 mutations with aggressive bladder cancer and poor prognosis [11]. Tobacco

Table 1. An in-depth and multi-faceted understanding of the bladder cancer landscape among Bangladeshi women

Variables/Factors	Categories	Number of Participants/Cases	Percentage (%)	p-value
Age-specific Prevalence	18-29	8	2.5	0.04
	30-39	20	5.4	0.02
	40-49	32	7.8	0.001
	50-59	40	9.1	<0.001
	60+	12	2.7	0.03
Gene Mutations	FGFR3	80	71.4	<0.001
	TP53	40	35.7	0.001
Tobacco Smoke Exposure	Yes	60 (among bladder cancer cases)	53.6	<0.001
	No	52 (among bladder cancer cases)	46.4	0.01
Satisfaction with Treatment	Satisfied (Diagnosis)	72	64.3	<0.001
	Neutral (Diagnosis)	24	21.4	0.05
	Unsatisfied (Diagnosis)	16	14.3	0.01
	Satisfied (Treatment)	90	80.4	<0.001
	Neutral (Treatment)	12	10.7	0.05
	Unsatisfied (Treatment)	10	8.9	0.01
Awareness Level	Aware	656	33.1	0.001
	Unaware	1328	66.9	<0.001
Educational Campaigns	Seen	564	28.4	0.01

smoke's association with bladder cancer in our study aligns with previous research establishing tobacco as a primary risk factor for bladder cancer [12]. The carcinogenic compounds present in tobacco can accumulate in the urine and damage the lining of the bladder, increasing cancer risk [13]. Given the prevalence of tobacco usage in Bangladesh, public health initiatives aimed at curtailing its consumption could be vital in reducing bladder cancer incidences. The relative satisfaction concerning diagnosis and treatment among participants is a silver lining, reflecting improvements in healthcare infrastructure and patient care in Bangladesh. Nevertheless, there is a palpable need for enhancing early detection measures to further increase the satisfaction and prognosis rates. Delayed diagnosis often results in advanced-stage disease, which is more challenging to treat and has a poorer prognosis [14]. Alarmingly, our findings suggest a significant lack of awareness regarding bladder cancer symptoms among Bangladeshi women. Awareness plays a pivotal role in early detection and improved prognosis. Countries with robust awareness campaigns have observed higher early-stage detection and better patient outcomes [15]. Bangladesh's public health sector needs to prioritize bladder cancer awareness, emphasizing both its risk factors and early signs, ensuring timely medical consultation and intervention. In conclusion, while strides have been made in the diagnosis and treatment realms, the need for targeted awareness campaigns and continued research, especially into the genetic underpinnings of bladder cancer in Bangladeshi women, remains pressing. Future endeavors should focus on combining epidemiological data with molecular insights to tailor treatments and preventive measures specific to this demographic [16].

5. CONCLUSION

The study underscores the significant prevalence of anemia among reproductive age women in Bangladesh, drawing attention to multifarious risk factors including dietary inadequacies, menstrual irregularities, and environmental toxins. The repercussions of anemia transcend clinical implications, adversely affecting reproductive

health and posing broader socio-economic challenges. The findings emphasize the exigent need for a multifaceted approach integrating awareness, early diagnosis, preventive strategies, and timely interventions. Tackling anemia in this demographic is paramount not just for individual well-being but also for the broader socio-economic advancement of Bangladesh.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The ethical approval for this study was considered by the Ministry of Health, Government of Peoples Republic of Bangladesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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