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Prevalence and associated risk factors of suicidal behaviors among cancer patients in a tertiary care hospital in Bangladesh

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Suicide-related behaviors among cancer patients represent a significant yet understudied public health concern in Bangladesh. This study aimed to determine the prevalence of suicidal behaviors (suicidal ideation, suicide plan, suicide attempt) and identify associated risk factors among cancer patients in Bangladesh. A cross-sectional study was conducted at the National Institute of Cancer Research & Hospital using a convenience sampling method among a total of 318 cancer patients between January and February, 2024. Data were collected on socio-demographics, clinical characteristics, and past-year suicidal behaviors. Chi-square tests and logistic regression were used to explore the association between suicidal behaviors and various socio-demographic, and clinical factors. The prevalence of past-year suicidal ideation, plan, and attempt was 22.3%, 13.8%, and 5.7%, respectively. Bladder and cervical cancer patients show the highest rates of suicidal behaviors. Key risk factors for suicidal behaviors included lower income, advanced cancer stages, and inadequate social support (all $p < 0.05$). Furthermore, higher education and unemployment appeared protective against suicidal ideation ($p < 0.05$). Among female participants, patients with breast cancer were less likely to attempt suicide than those with cervical cancer ($p < 0.05$). This study underscores the urgent need for routine mental health screening, risk assessments, and integrated social and financial support programs for cancer patients to reduce suicide risk and improve their quality of life.

Keywords Suicidal ideation, Suicide attempt, Suicide plan, Cancer, Bangladesh

Suicide is a tragic outcome of mental distress, affecting individuals, families, and communities and leaves a lasting impact on those left behind[1]. According to Centers of Disease Control and Prevention, suicide is the act of intentionally causing one's own death through self-inflicted harm[2]. It can also be understood as a process or continuum of thoughts and behaviors that progress from mild to more serious forms of suicidality, commonly including suicidal ideation, the development of a suicide plan, and suicide attempts[3]. Suicidal ideation often referred to as suicidal thoughts or ideas, encompasses a range of thoughts, desires, and contemplations about death and suicide. A suicide attempt occurs when an individual inflicts harm on themselves with the purpose of dying, but does not succeed[2,4].Whereas A suicide plan, on the other hand, outlines specific details, including the timeframe, method, and location of the intended act[5]. Suicidal ideation, the creation of a suicide plan, and actual suicide attempts are significant risk factors for eventual suicide completion[6].

Cancer poses a significant public health challenge, not only it is one of the leading cause of death globally but also due to its severe impact on patients' psychosocial well-being, which can increase the risk of suicide[7]. In 2020, nearly 10 million people worldwide died from cancer, equating to one in every six deaths globally[8]. The World Health Organization reported 20 million new cancer cases in 2022, with 9.7 million cancer-related deaths, and more than 53.5 million people were living within five years of a cancer diagnosis[9]. In Bangladesh, cancer presents a growing burden, responsible for 10% of all annual deaths and ranking as the sixth leading cause of

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death among non-communicable diseases[10]. Global Cancer Observatory 2022 data reported 167,256 new cancer cases and 116,598 deaths due to cancer in Bangladesh, with age-standardized incidence and mortality rates of 105.6 and 74.7 per 100,000, respectively[11].

In patients with cancer, suicidal thoughts are alarmingly prevalent. A cancer diagnosis often triggers thoughts about death, exacerbated by feelings of stigma, social isolation, and psychological distress. Factors such as depression, hopelessness, demoralization, physical pain, a perceived lack of social support, and existential worries are closely related to suicidal behavior among cancer patients[12]. Additionally, patients may feel they are a burden to others or desire control over their circumstance, contributing to an increased suicide risk[12]. Research has consistently shown that individuals with cancer are at higher risk of suicide compared to the general population[7].

Numerous global studies have documented suicidal behavior among cancer patients, including research conducted in Vietnam[13], South Korea[14], China[15], Ethiopia[16], the United Kingdom[17], Italy[18], and Spain[19]. These studies highlight association between suicidal behaviors and variety of factors most notably depression, anxiety, pain, cancer treatment side effects, cancer comorbidity, feelings of despair, hopelessness, personality disorder, low social support, retirement age, and a history of suicide attempts[13–19]. These findings emphasize the heightened vulnerability of cancer patients to suicide thoughts and actions.

Suicide remains a leading causes of death worldwide[20], with an estimated 726,000 people dying by suicide each year, and many more attempting to take their own lives[1]. In Bangladesh, the situation is similarly alarming with between 10,000 and 14,000 individuals taking their lives annually, making suicide the country's second leading cause of death after road accidents[21]. The suicide rate in Bangladesh has been steadily increasing over the years[22].

This study offers a novel contribution to the current body of information by emphasizing on the prevalence and risk factors of suicidal behaviors among cancer patients in Bangladesh. While some studies have addressed mental health issues such as depression and anxiety among cancer patients, the exploration of suicidal behavior in this population remains underexplored[23]. Despite the well-established links between mental health issues and increased suicide risk in cancer patients, this critical aspect remains largely undiscussed in the existing literature[23]. It is important to note that, despite the fact that global studies have emphasized the prevalence behaviors among cancer patients, no study has yet comprehensively examined the unique demographic and clinical factors that contribute to suicidal behaviors in cancer patients in Bangladesh.

Recognizing the critical gap in the literature, this study aims to investigate suicidal behaviors and its associated risk factors among cancer patients in Bangladesh. By addressing this gap, the research aims to provide valuable insights into the unique challenges faced by cancer patients. These findings will help inform the development of targeted suicide prevention programs that address the specific needs of cancer patients, ultimately improving mental health support and reducing suicide risk within this high-risk group of people or population.

Methodology

Study setting and population

A cross-sectional study was conducted at the National Institute of Cancer Research & Hospital in Dhaka, Bangladesh, the country's sole tertiary-level facility providing interdisciplinary care for cancer patients. The hospital is involved in a wide range of activities, including diagnostic services for cancer detection, various treatments such as surgery, radiotherapy, and chemotherapy. Additionally, the institute has developed national guidelines for high-quality, cost-effective treatment plans for common cancers in the country. The study was carried out from January, 2024 to February, 2024. The study population comprised cancer patients with any type or stage of cancer and were willing to participate in the study.

Sampling strategy

Data was collected in inpatient and outpatient settings through a non-probability convenient sampling approach. This method was chosen due to its practicality, allowing researchers to include participants who were readily accessible during the study period. Moreover, the sample was carefully selected to include a diverse range of cancer types and stages, ensuring a broad representation within the constraints of the hospital setting. The study included patients aged 18 years or older, regardless of gender, who had a confirmed cancer diagnosis based on pathological examination and were actively receiving oncological treatment during the study period. Additionally, participants were required to show no signs of cognitive impairment to ensure accurate responses during data collection. Conversely, patients who had completely recovered from cancer, those with serious medical conditions that impaired their ability to understand or answer questions, and individuals enrolled in other clinical trials that could influence their psychological responses were excluded from the study.

Sample size calculation

The sample size was calculated using the formula: $n = (z)^2 p (1-p)/d^2$; where p represents the estimated population proportion, d is the permitted margin of error, z indicates the degree of confidence based on the standard normal distribution, and n is the sample size. A 95% confidence interval (CI) was applied with $z = 1.96$ and $d = 0.05$. Additionally, a sample proportion of 50.0% ($p = 0.50$) was used due to the absence of any previous studies on this specific population. Using this equation, the calculated sample size was 377. Taking into account a 10% nonresponse rate, the final required sample size increased to 415. However, despite our efforts, we could only gather data from 318 patients, which was below the necessary minimum sample size of 415. Several potential participants opted out of the study, contributing to the reduced sample size. Additionally, during data collection, some individuals did not meet the eligibility criteria or were excluded, further reducing the pool of participants. Limited access to certain patients and wards also posed challenges that impacted our data collection efforts.

Data collection instruments and data collectors

Data were collected through structured questionnaires and face-to-face interviews. Before the data collection process, written approval was secured from the hospital administrator. Participants had to provide written informed consent to confirm their voluntary participation in the study. To prioritize the well-being of cancer patients, both inpatients and outpatients, interview schedules were adjusted to be flexible, permitting breaks or rescheduling when necessary due to medical treatments or fatigue. Privacy was emphasized, and interviews took place in a calm, private space to ensure comfort and confidentiality. Data collection was conducted by interviewers who went through comprehensive training in data collection techniques and tools, ethical considerations, and specific needs of cancer patients. Supervision was maintained throughout the data collection process, with a supervisor checking each questionnaire daily for completeness. A pilot study was conducted on 5% of the sample (excluded from the final analysis) to identify any potential issues with the data collection tools and assess the reliability of the questionnaires and the data collectors' competence. Additionally, coordination with medical stuff ensured that interviews did not interfere with patient care and treatment schedules. Each interview was designed to last approximately 15–20 min.

Study variables

The content of questionnaires includes predictor variables and outcome variables. (A) The predictor variables: these variable includes, sociodemographic characteristics (age, sex, marital status, level of education, residence area, occupation, monthly income, current substance use, and social support), clinical characteristics (time since cancer diagnosis, cancer stage, family history of cancer, cancer therapy, types of cancer, comorbid medical illness, and performance status). (B) The outcome variables: these are suicidal ideation, suicide plan and suicide attempt. The following conditions were considered comorbidity: hypertension, obesity, hyperlipidemia, coronary artery disease, cerebrovascular disease, cardiovascular issues, kidney disease, liver disease, asthma/ chronic obstructive pulmonary disease, stroke, chronic lung disease, arthritis, and depression. Participants' substance use over the past month was evaluated to determine their current substance use status. Individuals who reported using any of the specified substances namely tobacco, alcohol, or drugs were categorized as substance users.

Measures

Suicidal ideation, plan and attempt
The study assessed suicidal behaviors, encompassing suicidal ideation, suicide plan, and suicide attempts, by utilizing questions derived from previous research that necessitated binary 'yes/no' responses. Participants were asked if they had experienced suicidal ideation in the past year, whether such thoughts had been persistent, if they had ever developed a suicide plan, and if they had attempted suicide in the previous year[24].

Performance status
Performance status (the patient's level of functioning seen from their daily activity, physical ability and self-care) was determined using the one item Eastern Cooperative Oncology Group (ECOG) performance status scale[25] ranges from 0 to 4. A grade of 0–1 signifies a favorable performance status, while a grade of 2–4 indicates a less favorable performance status.

Social support
Social support was assessed using the three-item Oslo Social Support Scale (OSSS-3), which includes questions regarding the primary support network, additional concerns, and the accessibility of practical assistance. The first item was rated on a four-point scale, while the other two items were evaluated using a five-point scale. As a result, the combined score of the three items amounted to 14. A score ranging from 3 to 8 indicates poor support, while a score of 9 to 11 represents moderate support, and a score of 12 to 14 indicates strong support[25]. The Cronbach alpha coefficient for social support was 0.705 for the present study.

Statistical analysis

Data analysis was carried out using the Statistical Package for Social Science (SPSS) version 22.0 and Microsoft Excel 2016, with data entry completed in Excel as well. SPSS 22.0 was utilized to generate descriptive statistics, including frequencies, percentages, means, as well as performing chi-square tests and Fisher's exact tests. Suicidal ideation, plan, and attempt were analyzed separately by comparing categorical variables using chi-square tests and Fishers exact tests. The study also evaluated multicollinearity within the data and applied the Hosmer-Lemeshow test to assess the goodness of fit for the multivariable logistic regression model. For the Hosmer-Lemeshow test, the p-values were 0.392 for suicidal ideation, 0.097 for the suicide plan, and 0.162 for suicide attempts, indicating acceptable model fit for all three dependent variables. A mean VIF value below 10 indicated no multicollinearity. Variables identified in the bivariate analysis were included in the binary logistic regression, both in unadjusted and adjusted models. The dependent variables were suicidal ideation, plan, and attempt. The results of logistic regression were presented with 95% confidence intervals, and a *p*-value of 0.05 was considered statistically significant.

Ethical consideration

The study protocol was carefully reviewed and approved by the Institutional Ethical Committee of Patuakhali Science and Technology University (Approval no. PSTU/IEC/2023/65 (7)). All procedures were carried out in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants prior to their inclusion in the study. Given that the participants were cancer patients, extra care was taken to ensure that they fully understood the study's purpose, procedures, potential risks, and benefits. Participants were reassured that their decision to participate or withdraw would not affect their medical care in any way. To ensure the protection

of participants' rights and well-being, particular care was taken to account for their vulnerability due to their medical conditions. All personal data were anonymized to ensure confidentiality.

Results

Sociodemographic and clinical characteristics of the participants

Most of the participants (65.7%) were aged 50 or above (mean age: 54.54 ± 11.33), and over half (60.7%) were male. A large proportion (77.7%) were unemployed, and a majority (60.4%) reported household monthly income between 30,000 and 50,000. Notably, only a small percentage (9.1%) indicated having strong social support. The participants had various types of cancer, with the most common being lung (35.2%), breast (22.0%), and prostate (16.7%) cancers. A large majority (86.8%) were diagnosed at localized stages. More than half (52.8%) were undergoing chemotherapy, while 18.2% had not yet received any treatment. Additionally, a vast majority (94.0%) had comorbid medical illness (Table 1).

Prevalence of suicidal behaviors

The current study revealed that 22.3% of participants experienced suicidal ideation within the past-year, 13.8% had formulated suicide plans, and 5.7% reported attempting suicide during the same period (Fig. 1).

Association between socio-demographics and suicidal behaviors

Table 2 presents an association between participants' suicidal behaviors and socio-demographic characteristics, as indicated by the Chi-square test. Educational status (χ^2=10.99, p=0.027), employment status (χ^2=10.56, p=0.005), and household monthly income (χ^2=13.62, p=0.001) were all significantly associated with suicidal ideation. Additionally, household monthly income was significantly linked to suicide attempts (χ^2=13.45, p=0.001) and suicidal plans (χ^2=18.34, p<0.001).

Association between clinical characteristics and suicidal behaviors

The Chi-square test also revealed significant associations between clinical characteristics and suicidal behaviors. Suicidal ideation was significantly associated with the types of cancer (χ^2=23.75, p<0.001) and cancer stage (χ^2=25.20, p<0.001). Additionally, participants with certain types of cancer (χ^2=13.07, p=0.023) and advanced cancer stages (χ^2=26.19, p=0.013) were linked to a higher likelihood of having a suicidal plan. Types of cancer were also significantly associated with suicide attempts (χ^2=16.95, p=0.005) (Table 2).

Risk factors for suicidal ideation

For suicidal ideation, significant findings show that participants with a bachelor's or higher degree had an 82% reduced likelihood of experiencing suicidal ideation (AOR=0.18, 95% CI: 0.03–0.97, p=0.047) compared to uneducated individuals (Table 3). Additionally, unemployed individuals were 68% less likely to report suicidal ideation (AOR=0.32, 95% CI: 0.12–0.87, p=0.026) compared to those employed. In terms of income, those earning 30,000–50,000 had an 82% lower likelihood (AOR=0.18, 95% CI: 0.08–0.45, p<0.001), and participants earning more than 50,000 had a 75% reduced likelihood of ideation (AOR=0.25, 95% CI: 0.08–0.79, p=0.018), compared to those with incomes under 30,000. Furthermore, individuals with localized cancer, were 87% less likely to experience suicidal ideation (AOR=0.13; 95% CI: 0.05–0.33, p<0.001)) compared to those with advanced stages cancer. Moderate social support also showed protective effects, reducing the likelihood of suicidal ideation by 68% (AOR=0.32, 95% CI: 0.15–0.68, p=0.003) compared to poor social support.

Risk factors for suicide plans

For suicide plans, participants with household incomes of 30,000–50,000 were 82% less likely to form a suicide plan (AOR=0.18, 95% CI: 0.07–0.49, p=0.001), and those earning over 50,000 had a 79% lower likelihood of forming a plan (AOR=0.21, 95% CI: 0.05–0.81, p=0.024) compared to participants earning less than 30,000 (Table 3). Additionally, individuals with localized cancer were 74% less likely to have a suicide plan (AOR=0.26, 95% CI: 0.09–0.75, p=0.013) than those with advanced cancer. Moderate social support was again protective with participants having a 69% lower chance of making a suicide plan (AOR=0.31, 95% CI: 0.13–0.75, p=0.009) compared to those with poor social support.

Risk factors for suicide attempts

Regarding suicide attempts, participants with a household income of 30,000–50,000 were 90% less likely to attempt suicide (AOR=0.10, 95% CI: 0.02–0.50, p=0.005) compared to those earning less than 30,000 (Table 3). Similarly, those earning over 50,000 had an 88% lower likelihood of attempting suicide (AOR=0.12, 95% CI: 0.02–0.99, p=0.049) compared to those earning less than 30,000. Localized cancer reduced the likelihood of attempting suicide by 84% (AOR=0.16, 95% CI: 0.03–0.90, p=0.038) compared to advanced cancer. Participants with breast cancer were 87% less likely to attempt suicide (AOR=0.13, 95% CI: 0.02–0.99, p=0.049) compared to those with cervical cancer. Finaly, participants with moderate social support were 79% less likely to attempt suicide (AOR=0.21, 95% CI: 0.05–0.93, p=0.040) compared to those with poor social support.

Discussions

This is the first study in Bangladesh to investigate the prevalence of suicidal behaviors among cancer patients, providing valuable insights for better management of patients with cancers. The purpose of this study was to evaluate the prevalence and contributing factors of suicidal ideation, plans, and attempts among patients with cancer. The prevalence of suicidal ideation in this study was 22.3% over the past year, aligning with similar research conducted in Eastern Ethiopia (22.9%)[26], China (26.3%)[27], Spain (25.2%)[19], and Italy (20%)[28]. However,

Variables	Frequency	Percentage %
Gender		
Female	125	39.3%
Male	193	60.7%
Age of the participant		
Less than 50 years	109	34.3%
50 years and above	209	65.7%
Marital status		
Single/divorced/separated	16	5.0%
Married	302	95.0%
Educational status		
Uneducated	18	5.7%
Primary	24	7.5%
Secondary	69	21.7%
Higher secondary	143	45.0%
Bachelor's or above	64	20.1%
Employment status		
Retired	17	5.3%
Employed	54	17.0%
Unemployed	247	77.7%
Household monthly income		
< 30,000	57	17.9%
30,000–50,000	192	60.4%
> 50,000	69	21.7%
Current substance use		
No	126	39.6%
Yes	192	60.4%
Social support		
Poor support	158	49.7%
Moderate support	131	41.2%
Strong support	29	9.1%
Types of cancer		
Cervical cancer	24	7.5%
Bladder cancer	35	11.0%
Breast cancer	70	22.0%
Prostate cancer	53	16.7%
Lung cancer	112	35.2%
Other's cancer [†]	24	7.5%
Time since cancer diagnosis		
< 18 month	203	63.8%
≥ 18 months	115	36.2%
Cancer stage		
Localized cancer	276	86.8%
Advanced cancer	42	13.2%
Cancer therapy		
Chemotherapy	168	52.8%
Surgery and chemotherapy	72	22.6%
Don't receive treatment	58	18.2%
Chemotherapy and Radiotherapy	20	6.3%
Co-morbid medical illness		
Continued		

Variables	Frequency	Percentage %
Absent	19	6.0%
Present	299	94.0%
Performance status		
Good performance	171	53.8%
Poor performance	147	46.2%

Table 1. Characteristics of the participants. †Included colorectal cancer, blood cancer, stomach cancer, brain cancer, liver cancer, prostate cancer, and ovarian cancer.
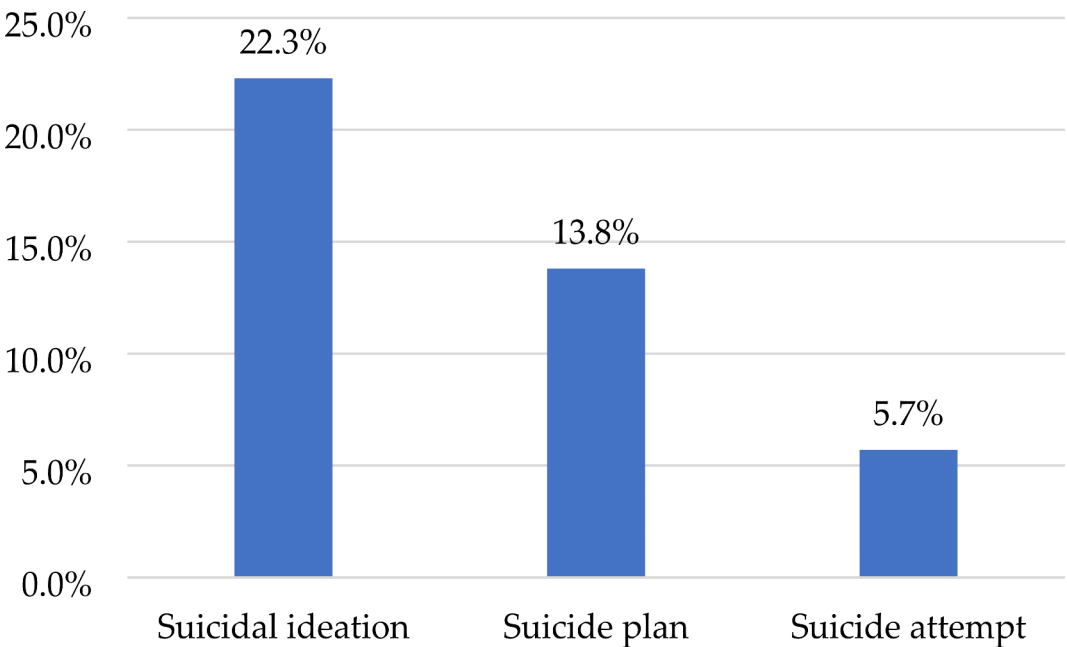

Fig. 1. Prevalence of past-year suicidal behaviors among cancer patients.

the findings are higher than those reported in Canada (6%)[29], United kingdom (7.8%)[17], Japan (8.6%)[30], Turkey (7.8%)[31], Vietnam (8.2%)[13], Germany (14.3%)[32], and Korea (11.4%)[33]. On the other hand, the prevalence of suicidal ideation noted in this study is lower than in South Africa (71.4%)[34] and Portugal (34.6%)[35]. The variation could potentially be attributed to differences in the study duration, the focus on specific types of cancer, or the inclusion criteria for the participants. For example, this study examined suicidal ideation over the past 12 months, whereas the study from the United Kingdom[17] assessed suicidal ideation over the previous two weeks. The study from South Africa included only participants with cervical cancer, whereas our study involved patients with all types of cancer, which could also explain the variation in results between these studies[34].

In this study, 13.8% of cancer patients formulated a suicide plan in the past year. Notably, no previous studies have specifically examined the prevalence of suicide planning among cancer patients, making this is an important and novel finding. The higher prevalence of suicide planning observed in our study underscores the need for increased attention to the mental health challenges faced by this population. Cancer patients frequently face a complex array of physical pain, mental discomfort, and uncertainty about their future, all of which can exacerbate feelings of hopelessness and raise the risk of suicide planning.

The prevalence of suicide attempts among participants in this study was 5.7% over the past year. This result is consistent with similar studies in China (4.7%)[36], Colombia (4.5%)[37], and Ethiopia (5.5%)[16]. However, the rate of suicidal attempts in this study is lower than those reported in Eastern Ethiopia (9.8%)[26], Ethiopia Mekelle (8.9%)[38], Korea (12.7%)[14], Turkey(12.7%)[39] and China(14.6%)[40]. These higher rates may be due to more severe health outcomes, differences in mental health resources, or greater social and economic pressure on cancer patients in these regions. In contrast, lower rates of suicide attempts compared to the current study have been reported in Canada (0.9%)[41], and Sweden (1.07%)[42]. These differences could be attributed to stronger healthcare infrastructures, better access to mental health services, more robust social safety nets, which help to alleviate some of the financial and emotional stress faced by the patients with cancers.

This study also revealed that cancer patients with a monthly household income of 30,000 to 50,000 or above 50,000, were less likely to experience suicidal ideation, formulate suicide plans, or attempt suicide compared to those with a household income of less than 30,000. This findings align with other research demonstrating that the probability of experiencing suicidal ideation increases as household income decreases[43]. Yang et al. found

Variables	Suicidal ideation			Suicide plan			Suicide attempt		
	Yes (%)	χ2	*p*-value	Yes (%)	χ2	*p*-value	Yes (%)	χ2	*p*-value
Gender									
Female	30 (24.0)	0.33	0.564	21 (16.8)	1.52	0.218	10 (8.0)	2.11	0.146
Male	41 (21.2)			23 (11.9)			8 (4.1)		
Age of the participant									
Less than 50 years	23 (21.1)	0.14	0.705	14 (12.8)	0.14	0.711	7 (6.4)	0.18	0.671
50 years and above	48 (23.0)			30 (14.4)			11 (5.3)		
Marital status									
Single/divorced/separated	4 (25.0)	0.07	0.792	4 (25.0)	1.76	0.184	1 (6.3)	0.01	0.917
Married	67 (22.2)			40 (13.2)			17 (5.6)		
Educational status									
Uneducated	9 (50.0)	10.99	**0.027**	5 (27.8)	7.93	0.094	3 (16.7)	6.10	0.192
Primary	4 (16.7)			4 (16.7)			2 (8.3)		
Secondary	16 (23.2)			11 (15.9)			5 (7.2)		
Higher secondary	33 (23.1)			21 (14.7)			5 (3.5)		
Bachelor's or above	9 (14.1)			3 (4.7)			3 (4.7)		
Employment status									
Employed	17 (31.5)	10.56	**0.005**	11 (20.4)	4.18	0.123	4 (7.4)	5.56	0.062
Unemployed	46 (18.6)			29 (11.7)			11 (4.5)		
Retired	8 (47.1)			4 (23.5)			3 (17.6)		
Household monthly income									
< 30,000	23 (40.4)	13.62	**0.001**	18 (31.6)	18.34	**< 0.001**	9 (15.8)	13.45	**0.001**
30,000–50,000	33 (17.2)			19 (9.9)			6 (3.1)		
> 50,000	15 (21.7)			7 (10.1)			3 (4.3)		
Types of cancer									
Cervical cancer	7 (29.2)	23.75	**< 0.001**	5 (20.8)	13.07	**0.023**	4 (16.7)	16.95	**0.005**
Bladder cancer	15 (42.9)			9 (25.7)			5 (14.3)		
Breast cancer	14 (20.0)			10 (14.3)			2 (2.9)		
Prostate cancer	15 (28.3)			7 (13.2)			2 (3.8)		
Lung cancer	11 (9.8)			7 (6.3)			2 (1.8)		
Other's cancer [†]	9 (37.5)			6 (25.0)			3 (12.5)		
Time since cancer diagnosis									
< 18 month	42 (20.7)	0.87	0.352	28 (13.8)	0.01	0.976	11 (5.4)	0.06	0.804
≥ 18 months	29 (25.2)			16 (13.9)			7 (6.1)		
Cancer stage									
Advanced cancer	22 (52.4)	25.20	**< 0.001**	33 (12.0)	6.19	**0.013**	13 (4.7)	3.53	0.060
Localized cancer	49 (17.8)			11 (26.2)			5 (11.9)		
Cancer therapy									
Chemotherapy	32 (19.0)	3.58	0.311	19 (11.3)	2.33	0.507	8 (4.8)	0.66	0.883
Surgery and chemotherapy	19 (26.4)			11 (15.3)			5 (6.9)		
Don't receive treatment	13 (22.4)			11 (19.0)			4 (6.9)		
Chemotherapy and Radiotherapy	7 (35.0)			3 (15.0)			1 (5.0)		
Co-morbid medical illness									
Present	65 (21.7)	0.99	0.318	40 (13.4)	0.88	0.347	17 (5.7)	0.01	0.938
Absent	6 (31.6)			4 (21.1)			1 (5.3)		
Current substance use									
No	32 (25.4)	1.13	0.287	22 (17.5)	2.29	0.129	10 (7.9)	2.02	0.155
Yes	39 (20.3)			22 (11.5)			8 (4.2)		
Social support									
Continued									

Variables	Suicidal ideation			Suicide plan			Suicide attempt		
	Yes (%)	χ2	*p*-value	Yes (%)	χ2	*p*-value	Yes (%)	χ2	*p*-value
Poor support	43 (27.2)			28 (17.7)			12 (7.6)		
Moderate support	22 (16.8)	4.53	0.104	12 (9.2)	4.40	0.111	4 (3.1)	2.86	0.240
Strong support	6 (20.7)			4 (13.8)			2 (6.9)		
Performance status									
Good performance	38 (22.2)	0.01	0.961	24 (14.0)	0.01	0.912	8 (4.7)	0.67	0.414
Poor performance	33 (22.4)			20 (13.6)			10 (6.8)		

Table 2. Distribution of sociodemographic and clinical characteristics with suicidal behaviors. Significant values are given in bold. [†]Included colorectal cancer, blood cancer, stomach cancer, brain cancer, liver cancer, prostate cancer, and ovarian cancer.

that leukemia patients from households with higher median incomes faced a lower risk of suicide[44]. Another study revealed that, various indicators of county-level socioeconomic status showed that lower socioeconomic status was linked to an increased risk of suicide among cancer patients[45]. A meta-analysis further supports this connection, highlighting a significant relationship between financial difficulties and suicidal ideation among cancer patients[46]. Patients experiencing financial hardships often worry about becoming a burden to their families or accumulating significant expenses without seeing any improvement in their condition. This sense of financial strain can exacerbate feelings of hopelessness and anxiety, contributing to suicidal behaviors[47]. Addressing these financial challenges through targeted interventions may be essential in reducing the risk of suicide in this vulnerable population.

Our study further indicated that patients with localized cancers were considerably less likely to have suicidal ideation, formulate suicide plans, or attempt suicide when compared to those with advanced-stages cancer. This aligns with several studies showing that cancer patients with advanced-stages are more likely to experience suicidal ideation compared to those with localized or early-stage cancer[15,16]. For instance, Zhong et al. reported that patients with metastatic or advanced-stage cancer were 2.94 times more likely to have suicidal thoughts than those in the local stage[15]. Araya et al. also found that cancer patients in Stage IV (advanced stage) were 2.08 times more likely to develop suicidal ideation compared to those in Stage I (localized stage)[38]. Molla et al. also observed that cancer patients in Stage IV (advanced stage) were 3.35 times more prone to developing suicidal ideation than those in Stage I (localized stage)[16]. Likewise, Hagezom et al. found that individuals with advanced-stage cancer were 2.15 times more likely to experience suicidal ideation compared to patients with early-stage cancer, aligning with our study's results[48]. Additionally, our study found that patients with advanced-stage cancer were more likely to attempt suicide compared to those with localized-stage cancer. For instance, Nigussie et al. found that cancer patients in Stage 4 (advanced stage) were 5.53 times more likely to attempt suicide than those in Stage 1 (localized)[26]. Molla et al. also demonstrated that patients with advanced-stage cancer (Stage IV) were 6.76 times more likely to make suicide attempts than those in the early stage (Stage I), closely related to our findings[16]. The higher risk of suicidal behavior in advanced-stage cancer patients can be attributed to more intense symptoms, aggressive treatments, and a poorer prognosis, which often lead to feelings of hopelessness and despair.

Participants with poor social support were significantly develop suicidal ideation, make suicide plans, and attempt suicide compared to those with moderate social support. The risk of experiencing these suicidal behaviors was substantially higher among individuals lacking adequate support systems. Many studies also found a correlation between suicidal ideation and social support among cancer patients[26,38]. For example, Nigussie et al. found that cancer patients with poor social support were three times more likely to develop suicidal ideation compared to those with strong social support, which closely aligns with our findings[26]. Similarly, Araya et al. demonstrated that cancer patients with no social support were 3.7 times more likely to develop suicidal ideation compared to those who had social support[38]. Both studies demonstrate that inadequate social support can significantly increase the likelihood of suicidal ideation in cancer patients, reflecting the findings of our study. However, Molla et al. (2022) found no such association between social support and suicidal behaviors[16]. Cancer patients often face immense emotional and psychological challenges related to their diagnosis, treatment, and prognosis. Without a strong support system, they may struggle to cope with these challenges, making them more vulnerable to suicidal behaviors.

Implications of the study

The results of this study underscore the fact that cancer patients who are unemployed, have low income, and have lower educational attainment are at a significantly higher risk of suicidal behaviors. Directly providing socioeconomic support, including financial counseling and employment assistance, through oncology facilities may be necessary to mitigate these risks. There is a strong correlation between clinical characteristics, such as advanced cancer phases and specific cancer types such as cervical cancer, and an increase in suicidal behaviors. This suggests that routine suicide risk assessments are necessary in cancer care, particularly for individuals with advanced-stage cancers. Furthermore, the research indicates that patients who have more strong social support networks are less likely to engage in suicidal behaviors. This implies that the integration of social support services and the facilitation of patient connections with peer and community groups may serve as effective preventative

Variables	Suicidal ideation[†]				Suicide plan[‡]				Suicide attempt[¥]			
	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue
Gender												
Female	Reference				Reference				Reference			
Male	0.85 (0.50–1.46)	0.564	1.01 (0.27–3.72)	0.986	0.67 (0.35–1.27)	0.220	0.87 (0.20–3.68)	0.848	0.50 (0.19–1.29)	0.153	0.59 (0.09–4.01)	0.593
Age of the participant												
Less than 50 years	Reference				Reference				Reference			
50 years and above	1.11 (0.64–1.95)	0.705	1.12 (0.54–2.30)	0.761	1.14 (0.57–2.25)	0.711	1.09 (0.48–2.45)	0.844	0.81 (0.30–2.15)	0.672	0.62 (0.18–2.14)	0.454
Marital status												
Single/divorced/separated	Reference				Reference				Reference			
Married	0.85 (0.27–2.74)	0.792	1.60 (0.34–7.53)	0.551	0.46 (0.14–1.49)	0.194	0.59 (0.12–2.80)	0.592	0.89 (0.11–7.18)	0.917	1.72 (0.13–22.57)	0.678
Educational status												
Uneducated	Reference				Reference				Reference			
Primary	0.20 (0.05–0.82)	0.026	0.23 (0.04–1.35)	0.104	0.52 (0.12–2.30)	0.389	0.96 (0.15–6.02)	0.962	0.45 (0.07–3.06)	0.417	2.17 (0.17–27.20)	0.549
Secondary	0.30 (0.10–0.89)	0.030	0.47 (0.11–2.02)	0.308	0.49 (0.15–1.66)	0.255	1.15 (0.22–5.95)	0.864	0.39 (0.08–1.82)	0.391	1.58 (0.14–16.98)	0.706
Higher secondary	0.30 (0.11–0.82)	0.019	0.65 (0.16–2.59)	0.546	0.45 (0.14–1.39)	0.163	1.65 (0.34–8.07)	0.533	0.18 (0.04–0.83)	0.181	1.36 (0.13–14.55)	0.801
Bachelor's or above	0.16 (0.05–0.52)	0.002	0.18 (0.03–0.97)	**0.047**	0.13 (0.03–0.60)	0.009	0.27 (0.03–2.22)	0.226	0.25 (0.04–1.34)	0.246	1.42 (0.09–23.54)	0.806
Employment status												
Employed	Reference				Reference				Reference			
Unemployed	0.50 (0.26–0.96)	0.038	0.32 (0.12–0.87)	**0.026**	0.52 (0.24–1.12)	0.095	0.33 (0.11–1.00)	0.051	0.58 (0.18–1.90)	0.371	0.61 (0.12–3.10)	0.550
Retired	1.93 (0.64–5.88)	0.245	1.28 (0.30–5.48)	0.740	1.20 (0.33–4.42)	0.781	0.86 (0.15–4.80)	0.860	2.68 (0.53–13.40)	0.230	2.26 (0.22–22.83)	0.490
Household monthly income												
< 30,000	Reference				Reference				Reference			
30,000–50,000	0.31 (0.16–0.59)	< 0.001	0.18 (0.08–0.45)	**< 0.001**	0.24 (0.11–0.49)	< 0.001	0.18 (0.07–0.49)	**0.001**	0.17 (0.06–0.51)	0.001	0.10 (0.02–0.50)	**0.005**
> 50,000	0.41 (0.19–0.89)	0.025	0.25 (0.08–0.79)	**0.018**	0.25 (0.09–0.64)	0.004	0.21 (0.05–0.81)	**0.024**	0.24 (0.06–0.94)	0.041	0.12 (0.02–0.99)	**0.049**
Types of cancer												
Cervical cancer	Reference				Reference				Reference			
Bladder cancer	1.82 (0.60–5.50)	0.288	2.08 (0.45–9.50)	0.345	1.31 (0.38–4.56)	0.666	1.30 (0.25–7.19)	0.733	0.83 (0.20–3.49)	0.803	1.10 (0.13–8.99)	0.931
Breast cancer	0.61 (0.21–1.75)	0.355	0.59 (0.17–2.08)	0.414	0.63 (0.19–2.08)	0.452	0.63 (0.17–2.38)	0.496	0.15 (0.02–0.86)	0.034	0.13 (0.02–0.99)	**0.049**
Prostate cancer	0.96 (0.33–2.78)	0.938	0.58 (0.10–3.42)	0.548	0.58 (0.16–2.05)	0.396	0.37 (0.05–2.67)	0.325	0.20 (0.03–1.16)	0.072	0.26 (0.02–4.05)	0.338
Lung cancer	0.26 (0.09–0.78)	0.016	0.25 (0.04–1.48)	0.126	0.25 (0.07–0.88)	0.031	0.23 (0.03–1.77)	0.159	0.09 (0.02–0.53)	0.008	0.14 (0.01–2.31)	0.171
Other's cancer [a]	1.46 (0.44–4.87)	0.541	1.32 (0.21–8.37)	0.767	1.27 (0.33–4.89)	0.732	1.14 (0.15–8.36)	0.898	0.71 (0.14–3.60)	0.683	1.19 (0.09–15.73)	0.893
Time since cancer diagnosis												
< 18 month	Reference				Reference				Reference			
≥ 18 months	1.29 (0.75–2.22)	0.352	1.18 (0.56–2.50)	0.657	1.01 (0.52–1.96)	0.976	1.10 (0.46–2.65)	0.828	1.13 (0.43–3.00)	0.804	0.88 (0.21–3.62)	0.855
Cancer stage												
Advanced cancer	Reference				Reference				Reference			
Localized cancer	0.20 (0.10–0.39)	< 0.001	0.13 (0.05–0.33)	**< 0.001**	0.38 (0.18–0.83)	0.016	0.26 (0.09–0.75)	**0.013**	0.37 (0.12–1.08)	0.070	0.16 (0.03–0.90)	**0.038**
Cancer therapy												
Chemotherapy	Reference				Reference				Reference			
Surgery and chemotherapy	1.52 (0.79–2.92)	0.204	1.67 (0.70–3.99)	0.251	1.41 (0.63–3.15)	0.396	1.42 (0.51–3.95)	0.501	1.49 (0.47–4.73)	0.496	1.98 (0.33–11.86)	0.691
Don't receive treatment	1.23 (0.59–2.54)	0.580	1.26 (0.49–3.21)	0.633	1.83 (0.81–4.13)	0.143	1.62 (0.59–4.41)	0.344	1.48 (0.43–5.11)	0.534	2.61 (0.46–14.72)	0.498
Chemotherapy and Radiotherapy	2.29 (0.84–6.20)	0.103	2.44 (0.65–9.09)	0.184	1.38 (0.37–5.16)	0.629	1.14 (0.22–5.99)	0.873	1.05 (0.12–8.88)	0.961	0.95 (0.05–18.91)	0.589
Continued												

Variables	Suicidal ideation†				Suicide plan‡				Suicide attempt¥			
	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue	OR (95% CI)	Pvalue	AOR (95% CI)	Pvalue
Co-morbid medical illness												
Present	Reference				Reference				Reference			
Absent	1.16 (0.61–4.54)	0.322	0.95 (0.26–3.48)	0.937	1.73 (0.55–5.46)	0.353	1.01 (0.23–4.56)	0.985	0.92 (0.12–7.32)	0.938	0.58 (0.04–8.91)	0.696
Current substance use												
No	Reference				Reference				Reference			
Yes	0.75 (0.44–1.28)	0.288	1.30 (0.52–3.21)	0.575	0.61 (0.32–1.16)	0.132	0.98 (0.34–2.81)	0.970	0.50 (0.19–1.31)	0.162	0.74 (0.16–3.42)	0.698
Social support												
Poor support	Reference				Reference				Reference			
Moderate support	0.54 (0.30–0.96)	0.036	0.32 (0.15–0.68)	**0.003**	0.47 (0.23–0.96)	0.039	0.31 (0.13–0.75)	**0.009**	0.38 (0.12–1.22)	0.104	0.21 (0.05–0.93)	**0.040**
Strong support	0.70 (0.27–1.83)	0.464	0.52 (0.15–1.82)	0.309	0.74 (0.24–2.30)	0.607	0.64 (0.15–2.62)	0.539	0.90 (0.19–4.26)	0.896	0.71 (0.09–5.40)	0.743
Performance status												
Good performance	Reference				Reference				Reference			
Poor performance	1.01 (0.60–1.72)	0.961	0.92 (0.45–1.85)	0.807	0.96 (0.51–1.83)	0.912	1.01 (0.45–2.31)	0.973	1.49 (0.57–3.87)	0.416	1.59 (0.45–5.64)	0.471
Constant			**25.63**	**0.029**			**13.01**	**0.114**			**2.47**	**0.740**

Table 3. Risk factors of suicidal ideation, plan and attempt among cancer patient. Significant values are given in bold. *OR* odd ratio, *AOR* adjusted odd ratio, *CI* confidence interval. [a]-included colorectal cancer, blood cancer, stomach cancer, brain cancer, liver cancer, prostate cancer, ovarian cancer. †-indicate Nagelkerke R square value 0.372. ‡- indicate Nagelkerke R square value 0.294. ¥- indicate Nagelkerke R square value 0.342.

measures. Overall, our results suggest that comprehensive support networks that integrate clinical, social, and economical interventions targeted to individual risk factors are necessary for cancer care.

Limitations of the study

The present study does have several limitations. Firstly, the use of a non-probability convenience sampling method may restrict the broader applicability of the results. The selection of participants based on availability may lead to potential selection bias, thereby diminishing the representativeness of the wider cancer patient population in Bangladesh. Furthermore, since recruitment was limited to a single institution, the study's ability to capture the full spectrum of variations in suicidal behaviors among cancer patients treated in other settings or regions may be constrained. This may limit the applicability of the findings to cancer patients in Bangladesh or other countries. Additionally, given the cross-sectional design, it is not possible to establish a causal relationship between the suicidal behaviors and the identified independent variables. A longitudinal design could potentially enhance understanding of the evolution and impact of these factors on suicidal behaviors over time in cancer patients. Moreover, exclusion of individuals with significant medical issues, cognitive challenges, or those involved in other clinical studies may result in the omission of important insights and unique psychological characteristics present in these populations. This exclusion may further restrict the study's relevance to the broader population of cancer patients, especially those facing greater health challenges or differing treatment histories. Finally, certain psychological factors, such as hopelessness, depression, anxiety and stress, which could influence suicidal behavior, were not included in this study. The lack of these attributes may limit the study's ability to adequately capture the complex psychological dynamics related with suicidal behaviors in cancer patients.

Conclusions

The study reveals a high prevalence of suicidal behaviors among cancer patients, with 22.3% experiencing suicidal ideation, 13.8% forming suicide plans, and 5.7% attempting suicide in the past year. Socio-demographic factors, such as lower education and employment status, and clinical characteristics like advanced cancer stages and specific cancer types (cervical cancer), were associated with higher rates of suicidal behavior. Protective factors, such as higher education, employment, localized cancers, and moderate social support, were associated with significantly lower likelihoods of suicidal behaviors. These results highlight the critical need for focused mental health interventions in cancer treatment. In order to identify and support individuals who are more likely to engage in suicide behaviors, we suggest routinely screening cancer patients for mental health issues, particularly those with late stages and lower socioeconomic level. Suicide risk could be further reduced by enhancing social support networks and offering specialized counseling. Early identification and support for these high-risk groups could reduce the progression from suicidal ideation to attempts, ultimately improving mental health outcomes for cancer patients. The results of this cross-sectional analysis can serve as a valuable reference, emphasizing the need for increased focus on cancer patients and their mental health and other factors to prevent suicidal behaviors.

Data availability

The data that support the findings of this study are available within the manuscript. Additional data may be provided upon reasonable request to the corresponding author.

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Author contributions

"M.Y.E. and N.R. were responsible for conceptualization, methodology, study design, and data acquisition. S.M.I., A.A.A., and N.R. performed formal analysis, data interpretation, and drafted the original manuscript. F.I., M.A.M., F.A.M., and N.R. contributed to visualization, supervision, and manuscript review and editing. All authors reviewed and approved the final version of the manuscript."

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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