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Research Article

THE PREVALENCE OF DEPRESSION AMONG CANCER PATIENTS FROM PRINCESS NOORAH ONCOLOGY CENTER AT JEDDAH

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Abstract:

Background: Cancer is a fatal disease in Saudi Arabia. According to WHO, "Cancers are the leading causes of mortality, with approximately 14 million new cases and 8.2 million cancer-related mortalities in 2012." Additionally, about 25% of cancer patients experience depression.

This study aims to estimate the prevalence of depression among cancer patients. Our study is a cross-sectional study and was conducted at Princess Noorah Oncology Center in King Abdulaziz Medical City, Jeddah.

Subjects and Methods: We studied patients (≥ 18 years old) in both genders with confirmed cancer diagnosis regardless of treatment initiation and who were aware of their diagnosis. The study consisted of 281 patients.

Results: Most patients were female (55.5%). For patients by age groups, 112 patients (39.9%) were at age group of 40 to 59, 91 patients (32.4%) were at ≥ 60 years old, 62 patients (22.1%) aged 20 to 39 and 16 patients (5.7%) aged < 20 years old. The most important factor causing depression among cancer patients was the number of chemotherapy cycles (p -value = 0.012). Additionally, based on the analysis of Patient Health Questionnaire-9 (PHQ9) scores, only 95 patients (33.8%) had no depression, while the rest suffered from varying degrees of depression. Mild depression 112 patients (39.9%) was the most common among patients with depression.

Conclusion: Early detection of depression is essential to enhance compliance and prognosis. However, further research is necessary to develop a standardized approach to mitigate depression among cancer patients.

Key words: Saudi Arabia, Depression, Cancer, PHQ9.

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INTRODUCTION:

Cancer is the uncontrolled growth of cells. Cancer cells often invade surrounding tissue and metastasize to distant sites [1]. Cancer is a common disease in Saudi Arabia. According to WHO, "Cancers are the leading causes of mortality worldwide, with approximately 14 million new cases and 8.2 million cancer-related mortalities in 2012" [2]. In Saudi Arabia, according to the Saudi Cancer Registry report, the total number of reported cancer cases was 13,706, with more female patients than male patients [7,127 (52%) vs. 6,579 (48%)] [3]. Depression is a serious illness that affects the patient's quality of life. Its symptoms include sadness and loss of interest. By the year 2020, depression is predicted to be the second cause of disability-adjusted life years lost, as reported by the World Health Organization [4]. The prevalence of depression is 13% worldwide, 17% in Saudi Arabia and between 15.3 % and 22% among Saudi Arabia patients in primary care [5].

Cancer patients are predisposed to depression because their future may seem uncertain and they fear death. Additionally, about one in every four cancer patients become depressed [6]. It is difficult to study depression because there are multiple diagnostic criteria and the symptoms vary from patient to patient, ranging from sadness to the major effects on patients [6]. Despite this, many studies were conducted to estimate the prevalence of depression among cancer patients. An early study showed a prevalence of 42% among cancer patients [7].

There is the lack of studies about the prevalence of depression among cancer patients in Saudi Arabia. Moreover, the findings from the studies conflict each other. Our study aims to estimate the prevalence of depression among cancer patients. The objective of this study was to measure the exact prevalence of depression among adult cancer patients. In case the study results show a high prevalence of depression, then we suggest initiating a screening program to detect depression among cancer patients and referring psychiatric consultation as required. Depression can lead to suicide and patients with such suicidal symptoms can be managed by medication or psychotherapy [8].

SUBJECTS AND METHODS:

This study was a cross-sectional study conducted at Princess Noorah Oncology Center in King Abdulaziz

Medical City, Jeddah which belongs to the Ministry of National Guard Health Affair. King Abdulaziz Medical City is a complex state with multiple hospitals. A total of 800 beds within campus belong to King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) that has a college of medicine. King Abdulaziz medical city contains the King Abdullah Medical research center (KAIMRC) in Jeddah. Princess Noorah Oncology Center is a tertiary health center specialized in treating cancer. Patients are referred to this medical city from all over the kingdom. The center provides treatment using all diagnostic tools and all cancer therapeutic methods for adults and pediatrics. It has an outpatient setting including chemotherapy and radiation areas. Also, it has its in-patients setting with a bone marrow transplant unit.

We studied patients aged ≥ 18 years irrespective of gender, diagnosed with cancer regardless of treatment initiation but with confirmed diagnosis and those who were fully aware of their diagnosis. We have excluded those who have been diagnosed with depression prior to diagnosis with cancer.

Inclusion Criteria:

Patients who were at the age of consent (≥ 18 years old), irrespective of gender, and were diagnosed with cancer at any stage regardless of treatment initiation.

Exclusion Criteria:

- Patients with history of depression prior to their diagnosis of cancer
- Patients who refuse to participate

According to the tumor registry annual report of 2013, the analytic cancer patient population in King Abdulaziz Medical City-Jeddah was 1116 cases. With a 5% error margin, a confidence level of 95% and a distribution response of 42%. Our sample size, using non- probability convenient inclusive sampling, was 281.

Cancer was staged into five groups (0-4) according to the size and spread [9].

- Stage 0: Also known as carcinoma *in situ*, which is the potential to develop in cancer
- Stage 1- 3: Presence of cancer in the later stages with a wider spread to nearby tissues
- Stage 4: Metastatic cancer

The severity of depression was categorized by PHQ9 test score as follows:

- No depression (0–4)
 - Mild depression (5–9)
 - Moderate depression (10–14)
 - Above moderate depression (15–19)
 - Severe depression (20–27)
- Classification of variables was as follows: Dependent variables:
- Diagnosis with cancer
 - Diagnosis with depression secondary to cancer

Independent variables:

- Age (continuous)
- Gender (categorical)
- Hospitalization (categorical)
- Social history (categorical)
- Marital status (categorical)
- Stage of cancer (categorical)
- Level of depression (questionnaire)

Note: No medical record numbers (MRNs) or names were used Data was collected using data collection sheet appendix #1. Depression data was collected using depression questionnaire appendix #2. All

collected data was entered on a hospital computer in a locked folder. Access to the folder was only available to research investigators. Data was sorted using an Excel sheet. The excel sheet was electronically encoded confidentially without any names or MRN. SPSS software was used to encode and analyze the data. This study was approved by the Institutional Review Board (IRB) of King Abdullah International Medical Research Center (KAIMRC).

RESULTS:

The study sample consisted of 281 cancer patients at Princess Noorah Oncology Center. Demographics demonstrated the majority of patients [277 (98.6%)] were Saudis. 156 (55.5%) patients were females. For patients by age groups, 91 patients (32.4%) were ≥ 60 years old and 62 patients (22.1%) were in the age group of 20–39 years. 56 patients (19.9%) were diagnosed in the age range of 20–39 years old and 52 patients (18.5%) were diagnosed at an age ≥ 60 years old. Further evidence regarding demographics are shown in **Table 1**.

Table 1. Demographic Characteristics and Medical History of Patients:**Table 1a:**

<u>Variables</u>	<u>Frequency</u>	<u>Percent</u>
<u>Age at first cancer diagnosis</u>		
<u>< 20</u>	<u>19</u>	<u>6.8 %</u>
<u>20–39</u>	<u>56</u>	<u>19.9 %</u>
<u>40–59</u>	<u>86</u>	<u>30.6 %</u>
<u>≥ 60</u>	<u>52</u>	<u>18.5 %</u>
<u>Unknown</u>	<u>68</u>	<u>24.2 %</u>
<u>Current age</u>		
<u>< 20</u>	<u>16</u>	<u>5.7 %</u>
<u>20–39</u>	<u>62</u>	<u>22.1 %</u>
<u>40–59</u>	<u>112</u>	<u>39.9 %</u>
<u>≥ 60</u>	<u>91</u>	<u>32.4 %</u>
<u>Sex</u>		
<u>Male</u>	<u>125</u>	<u>44.5 %</u>
<u>Female</u>	<u>156</u>	<u>55.5 %</u>
<u>Nationality</u>		
<u>Saudi</u>	<u>277</u>	<u>98.6 %</u>
<u>Non-Saudi</u>	<u>4</u>	<u>1.4 %</u>

Table 1b:

<u>Variables</u>	<u>Frequency</u>	<u>Percent</u>
<u>History of smoking</u>		
<u>Yes</u>	<u>30</u>	<u>10.7 %</u>
<u>No</u>	<u>240</u>	<u>85.4 %</u>
<u>Unknown</u>	<u>11</u>	<u>3.9 %</u>
<u>Cancer type</u>		
<u>Breast</u>	<u>44</u>	<u>15.7 %</u>
<u>Blood</u>	<u>111</u>	<u>39.5 %</u>

<u>Variables</u>	<u>Frequency</u>	<u>Percent</u>
<u>GI</u>	<u>66</u>	<u>23.5 %</u>
<u>Respiratory</u>	<u>10</u>	<u>3.6 %</u>
<u>Renal</u>	<u>9</u>	<u>3.2 %</u>
<u>Head and Neck</u>	<u>33</u>	<u>11.7 %</u>
<u>Genitourinary</u>	<u>2</u>	<u>0.7 %</u>
<u>Gynecological</u>	<u>6</u>	<u>2.1 %</u>
<u>Stage (0-4)</u>		
<u>Stage 1</u>	<u>26</u>	<u>9.3 %</u>
<u>Stage 2</u>	<u>69</u>	<u>24.6 %</u>
<u>Stage 3</u>	<u>55</u>	<u>19.6 %</u>
<u>Stage 4</u>	<u>99</u>	<u>35.2 %</u>
<u>Unknown</u>	<u>32</u>	<u>11.4 %</u>
<u>Previous surgical procedure</u>		
<u>None</u>	<u>38</u>	<u>13.5 %</u>
<u>Other</u>	<u>52</u>	<u>18.5 %</u>
<u>Unknown</u>	<u>7</u>	<u>2.5 %</u>
<u>Total number of chemo cycles</u>		
<u>< 5 cycles</u>	<u>187</u>	<u>66.5 %</u>
<u>5 - 10 cycles</u>	<u>71</u>	<u>25.3 %</u>
<u>> 10 cycles</u>	<u>23</u>	<u>8.2 %</u>

Table 1c:

<u>Variables</u>	<u>Frequency</u>	<u>Percent</u>
<u>Status of chemo treatment</u>		
<u>Complete</u>	<u>66</u>	<u>23.5 %</u>
<u>Incomplete</u>	<u>186</u>	<u>66.2 %</u>
<u>Unknown</u>	<u>29</u>	<u>10.3 %</u>
<u>Patient living without the disease</u>		
<u>Yes</u>	<u>33</u>	<u>11.7 %</u>
<u>No</u>	<u>235</u>	<u>83.6 %</u>
<u>Unknown</u>	<u>13</u>	<u>4.6 %</u>
<u>Local recurrence</u>		
<u>Yes</u>	<u>42</u>	<u>14.9 %</u>
<u>No</u>	<u>190</u>	<u>67.6 %</u>
<u>Unknown</u>	<u>49</u>	<u>17.4 %</u>
<u>Distant recurrence</u>		
<u>Yes</u>	<u>84</u>	<u>29.9 %</u>
<u>No</u>	<u>163</u>	<u>58.0 %</u>
<u>Unknown</u>	<u>34</u>	<u>12.1 %</u>
<u>Total</u>	<u>281</u>	<u>100.0 %</u>

The results of the Pearson's chi-squared test for association between PHQ9 score levels and each of the demographic and patients' revealed that there was a **statistically significant association** between PHQ9 and the Total number of Chemo cycles.(p-value = 0.012, *p ≤ 0.05). **Table 2** illustrates correlation between PHQ9 levels and demographic data with medical information.

Table 2. Correlation between PHQ9 levels and demographics and medical information:

<u>PHQ9 groups</u>					
<u>Variables</u>	<u>No depression</u>	<u>Mild depression</u>	<u>Moderate depression</u>	<u>Above moderate depression</u>	<u>Severe depression</u>
<u>Age at first cancer diagnosis</u>					
<u>< 20</u>	<u>63.2% (12)</u>	<u>26.3% (5)</u>	<u>5.3% (1)</u>	<u>0.0% (0)</u>	<u>5.3% (1)</u>
<u>20–39</u>	<u>41.1% (23)</u>	<u>37.5% (21)</u>	<u>17.9% (10)</u>	<u>3.6% (2)</u>	<u>0.0% (0)</u>
<u>40–59</u>	<u>27.9% (24)</u>	<u>40.7% (35)</u>	<u>18.6% (16)</u>	<u>8.1% (7)</u>	<u>4.7% (4)</u>
<u>≥60</u>	<u>23.1% (12)</u>	<u>44.2% (23)</u>	<u>23.1% (12)</u>	<u>5.8% (3)</u>	<u>3.8% (2)</u>
<u>Unknown</u>	<u>35.3% (24)</u>	<u>41.2% (28)</u>	<u>22.1% (15)</u>	<u>1.5% (1)</u>	<u>0.0% (0)</u>
					<u>0.115</u>
<u>Recent age</u>					
<u>< 20</u>	<u>50.0% (8)</u>	<u>37.5% (6)</u>	<u>6.3% (1)</u>	<u>0.0% (0)</u>	<u>6.3% (1)</u>
<u>20–39</u>	<u>45.2% (28)</u>	<u>33.9% (21)</u>	<u>17.7% (11)</u>	<u>3.2% (2)</u>	<u>0.0% (0)</u>
<u>40–59</u>	<u>34.8% (39)</u>	<u>39.3% (44)</u>	<u>17.0% (19)</u>	<u>6.3% (7)</u>	<u>2.7% (3)</u>
<u>≥ 60</u>	<u>22.0% (20)</u>	<u>45.1% (41)</u>	<u>25.3% (23)</u>	<u>4.4% (4)</u>	<u>3.3% (3)</u>
					<u>0.171</u>
<u>Sex</u>					

<u>Male</u>	<u>38.4% (48)</u>	<u>41.6% (52)</u>	<u>16.8% (21)</u>	<u>0.8% (1)</u>	<u>2.4% (3)</u>
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[0.052](#)

<u>Female</u>	<u>30.1% (47)</u>	<u>38.5% (60)</u>	<u>21.2% (33)</u>	<u>7.7% (12)</u>	<u>2.6% (4)</u>
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Nationality

<u>Saudi</u>	<u>33.6% (93)</u>	<u>39.7% (110)</u>	<u>19.5% (54)</u>	<u>4.7% (13)</u>	<u>2.5% (7)</u>
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[0.829](#)

<u>Non Saudi</u>	<u>50.0% (2)</u>	<u>50.0% (2)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>
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History of smoking

<u>Yes</u>	<u>40.0% (12)</u>	<u>40.0% (12)</u>	<u>20.0% (6)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>
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<u>No</u>	<u>33.3% (80)</u>	<u>39.2% (94)</u>	<u>19.6% (47)</u>	<u>5.4% (13)</u>	<u>2.5% (6)</u>
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[0.578](#)

<u>Unknown</u>	<u>27.3% (3)</u>	<u>54.5% (6)</u>	<u>9.1% (1)</u>	<u>0.0% (0)</u>	<u>9.1% (1)</u>
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Cancer type

<u>Breast</u>	<u>22.7% (10)</u>	<u>45.5% (20)</u>	<u>25.0% (11)</u>	<u>4.5% (2)</u>	<u>2.3% (1)</u>
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<u>Blood</u>	<u>45.0% (50)</u>	<u>36.9% (41)</u>	<u>13.5% (15)</u>	<u>4.5% (5)</u>	<u>0.0% (0)</u>
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<u>GI</u>	<u>33.3% (22)</u>	<u>40.9% (27)</u>	<u>19.7% (13)</u>	<u>3.0% (2)</u>	<u>3.0% (2)</u>
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<u>Respiratory</u>	<u>30.0% (3)</u>	<u>30.0% (3)</u>	<u>30.0% (3)</u>	<u>10.0% (1)</u>	<u>0.0% (0)</u>
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[0.275](#)

<u>Renal</u>	<u>22.2% (2)</u>	<u>55.6% (5)</u>	<u>11.1% (1)</u>	<u>0.0% (0)</u>	<u>11.1% (1)</u>
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<u>Head and Neck</u>	<u>18.2% (6)</u>	<u>39.4% (13)</u>	<u>27.3% (9)</u>	<u>9.1% (3)</u>	<u>6.1% (2)</u>
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<u>Genitourinary</u>	<u>50.0% (1)</u>	<u>50.0% (1)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>
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<u>Gynecological</u>	<u>16.7% (1)</u>	<u>33.3% (2)</u>	<u>33.3% (2)</u>	<u>0.0% (0)</u>	<u>16.7% (1)</u>
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Stage

<u>Stage 1</u>	<u>34.6% (9)</u>	<u>38.5% (10)</u>	<u>23.1% (6)</u>	<u>3.8% (1)</u>	<u>0.0% (0)</u>	
<u>Stage 2</u>	<u>39.1% (27)</u>	<u>31.9% (22)</u>	<u>20.3% (14)</u>	<u>4.3% (3)</u>	<u>4.3% (3)</u>	
<u>Stage 3</u>	<u>34.5% (19)</u>	<u>34.5% (19)</u>	<u>21.8% (12)</u>	<u>3.6% (2)</u>	<u>5.5% (3)</u>	0.446
<u>Stage 4</u>	<u>26.3% (26)</u>	<u>49.5% (49)</u>	<u>19.2% (19)</u>	<u>4.0% (4)</u>	<u>1.0% (1)</u>	
<u>Unknown</u>	<u>43.8% (14)</u>	<u>37.5% (12)</u>	<u>9.4% (3)</u>	<u>9.4% (3)</u>	<u>0.0% (0)</u>	
<u>Previous surgical procedure</u>						
<u>None</u>	<u>21.1% (8)</u>	<u>47.4% (18)</u>	<u>21.1% (8)</u>	<u>7.9% (3)</u>	<u>2.6% (1)</u>	
<u>Biopsy</u>	<u>36.4% (67)</u>	<u>37.0% (68)</u>	<u>19.0% (35)</u>	<u>5.4% (10)</u>	<u>2.2% (4)</u>	
						0.749
<u>Other</u>	<u>34.6% (18)</u>	<u>42.3% (22)</u>	<u>19.2% (10)</u>	<u>0.0% (0)</u>	<u>3.8% (2)</u>	
<u>Unknown</u>	<u>28.6% (2)</u>	<u>57.1% (4)</u>	<u>14.3% (1)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	
<u>Total number of chemo cycles</u>						
<u>< 5 cycles</u>	<u>40.6% (76)</u>	<u>33.2% (62)</u>	<u>19.3% (36)</u>	<u>5.3% (10)</u>	<u>1.6% (3)</u>	
<u>5–10 cycles</u>	<u>21.1% (15)</u>	<u>53.5% (38)</u>	<u>18.3% (13)</u>	<u>4.2% (3)</u>	<u>2.8% (2)</u>	0.012*
<u>> 10 cycles</u>	<u>17.4% (4)</u>	<u>52.2% (12)</u>	<u>21.7% (5)</u>	<u>0.0% (0)</u>	<u>8.7% (2)</u>	
<u>Status of chemo treatment</u>						
<u>Complete</u>	<u>39.4% (26)</u>	<u>39.4% (26)</u>	<u>16.7% (11)</u>	<u>3.0% (2)</u>	<u>1.5% (1)</u>	0.720

<u>Incomplete</u>	<u>32.3% (60)</u>	<u>39.2% (73)</u>	<u>19.4% (36)</u>	<u>5.9% (11)</u>	<u>3.2% (6)</u>	
<u>Unknown</u>	<u>31.0% (9)</u>	<u>44.8% (13)</u>	<u>24.1% (7)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	
<u>Patient living without the disease</u>						
<u>Yes</u>	<u>45.5% (15)</u>	<u>36.4% (12)</u>	<u>9.1% (3)</u>	<u>6.1% (2)</u>	<u>3.0% (1)</u>	
<u>No</u>	<u>31.9% (75)</u>	<u>40.9% (96)</u>	<u>20.4% (48)</u>	<u>4.3% (10)</u>	<u>2.6% (6)</u>	<u>0.761</u>
<u>Unknown</u>	<u>38.5% (5)</u>	<u>30.8% (4)</u>	<u>23.1% (3)</u>	<u>7.7% (1)</u>	<u>0.0% (0)</u>	
<u>Local recurrence</u>						
<u>Yes</u>	<u>33.3% (14)</u>	<u>42.9% (18)</u>	<u>23.8% (10)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	<u>0.338</u>
<u>No</u>	<u>34.7% (66)</u>	<u>37.4% (71)</u>	<u>17.9% (34)</u>	<u>6.3% (12)</u>	<u>3.7% (7)</u>	
<u>Unknown</u>	<u>30.6% (15)</u>	<u>46.9% (23)</u>	<u>20.4% (10)</u>	<u>2.0% (1)</u>	<u>0.0% (0)</u>	
<u>Disease recurrence</u>						
<u>Yes</u>	<u>26.2% (22)</u>	<u>40.5% (34)</u>	<u>28.6% (24)</u>	<u>2.4% (2)</u>	<u>2.4% (2)</u>	<u>0.191</u>
<u>No</u>	<u>37.4% (61)</u>	<u>39.3% (64)</u>	<u>14.1% (23)</u>	<u>6.1% (10)</u>	<u>3.1% (5)</u>	
<u>Unknown</u>	<u>35.3% (12)</u>	<u>41.2% (14)</u>	<u>20.6% (7)</u>	<u>2.9% (1)</u>	<u>0.0% (0)</u>	
<u>Total</u>	<u>33.8% (95)</u>	<u>39.9% (112)</u>	<u>19.2% (54)</u>	<u>4.6% (13)</u>	<u>2.5% (7)</u>	

* represents $p \leq 0.05$

There was **remarkable association** with difficulty of coping with depression and some demographics; such as, age at first presentation, number of cycles of chemotherapy and distant recurrence. Extensive results of the association between difficulty in coping with depression and demographics are denoted in **Table 3**.

Table 3. Correlation between difficulties' levels and demographics:

<u>Variables</u>	<u>Degrees of difficulty in coping with depression</u>				<u>p-value</u>
	<u>No Difficulty</u>	<u>Pretty Difficult</u>	<u>Very Difficult</u>	<u>Unbearably Difficult</u>	
<u>Age at first cancer diagnosis</u>					
<u>< 20</u>	<u>57.9% (11)</u>	<u>31.6% (6)</u>	<u>10.5% (2)</u>	<u>0.0% (0)</u>	<u>0.016*</u>
<u>20–39</u>	<u>42.9% (24)</u>	<u>55.4% (31)</u>	<u>1.8% (1)</u>	<u>0.0% (0)</u>	
<u>40–59</u>	<u>44.2% (38)</u>	<u>39.5% (34)</u>	<u>16.3% (14)</u>	<u>0.0% (0)</u>	
<u>≥ 60</u>	<u>36.5% (19)</u>	<u>34.6% (18)</u>	<u>23.1% (12)</u>	<u>5.8% (3)</u>	
<u>Unknown</u>	<u>41.2% (28)</u>	<u>45.6% (31)</u>	<u>11.8% (8)</u>	<u>1.5% (1)</u>	
<u>Recent age</u>					
<u>< 20</u>	<u>43.8% (7)</u>	<u>43.8% (7)</u>	<u>12.5% (2)</u>	<u>0.0% (0)</u>	<u>0.087</u>
<u>20–39</u>	<u>48.4% (30)</u>	<u>46.8% (29)</u>	<u>3.2% (2)</u>	<u>1.6% (1)</u>	
<u>40–59</u>	<u>45.5% (51)</u>	<u>42.0% (47)</u>	<u>12.5% (14)</u>	<u>0.0% (0)</u>	
<u>≥ 60</u>	<u>35.2% (32)</u>	<u>40.7% (37)</u>	<u>20.9% (19)</u>	<u>3.3% (3)</u>	
<u>Sex</u>					

<u>Male</u>	<u>44.0%</u> <u>(55)</u>	<u>44.0%</u> <u>(55)</u>	<u>11.2%</u> <u>(14)</u>	<u>0.8% (1)</u>	<u>0.693</u>
<u>Female</u>	<u>41.7%</u> <u>(65)</u>	<u>41.7%</u> <u>(65)</u>	<u>14.7%</u> <u>(23)</u>	<u>1.9% (3)</u>	
<u>Nationality</u>					
<u>Saudi</u>	<u>42.6%</u> <u>(118)</u>	<u>42.6%</u> <u>(118)</u>	<u>13.4%</u> <u>(37)</u>	<u>1.4% (4)</u>	<u>0.875</u>
<u>Non-Saudi</u>	<u>50.0% (2)</u>	<u>50.0% (2)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	
<u>History of smoking</u>					
<u>Yes</u>	<u>50.0%</u> <u>(15)</u>	<u>43.3%</u> <u>(13)</u>	<u>6.7% (2)</u>	<u>0.0% (0)</u>	<u>0.771</u>
<u>No</u>	<u>42.5%</u> <u>(102)</u>	<u>42.1%</u> <u>(101)</u>	<u>13.8%</u> <u>(33)</u>	<u>1.7% (4)</u>	
<u>Unknown</u>	<u>27.3% (3)</u>	<u>54.5% (6)</u>	<u>18.2% (2)</u>	<u>0.0% (0)</u>	
<u>Cancer type</u>					
<u>Breast</u>	<u>40.9%</u> <u>(18)</u>	<u>43.2%</u> <u>(19)</u>	<u>15.9% (7)</u>	<u>0.0% (0)</u>	<u>0.171</u>
<u>Blood</u>	<u>48.6%</u> <u>(54)</u>	<u>37.8%</u> <u>(42)</u>	<u>12.6%</u> <u>(14)</u>	<u>0.9% (1)</u>	
<u>GI</u>	<u>37.9%</u> <u>(25)</u>	<u>51.5%</u> <u>(34)</u>	<u>9.1% (6)</u>	<u>1.5% (1)</u>	
<u>Respiratory</u>	<u>60.0% (6)</u>	<u>40.0% (4)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	
<u>Renal</u>	<u>11.1% (1)</u>	<u>77.8% (7)</u>	<u>11.1% (1)</u>	<u>0.0% (0)</u>	
<u>Head and Neck</u>	<u>39.4%</u> <u>(13)</u>	<u>33.3%</u> <u>(11)</u>	<u>24.2% (8)</u>	<u>3.0% (1)</u>	
<u>Genitourinary</u>	<u>50.0% (1)</u>	<u>50.0% (1)</u>	<u>0.0% (0)</u>	<u>0.0% (0)</u>	

<u>Gynecological</u>	<u>33.3% (2)</u>	<u>33.3% (2)</u>	<u>16.7% (1)</u>	<u>16.7% (1)</u>	
<u>Stage</u>					
<u>Stage 1</u>	<u>53.8% (14)</u>	<u>34.6% (9)</u>	<u>11.5% (3)</u>	<u>0.0% (0)</u>	
<u>Stage 2</u>	<u>55.1% (38)</u>	<u>33.3% (23)</u>	<u>8.7% (6)</u>	<u>2.9% (2)</u>	
<u>Stage 3</u>	<u>47.3% (26)</u>	<u>40.0% (22)</u>	<u>10.9% (66)</u>	<u>1.8% (1)</u>	<u>0.072</u>
<u>Stage 4</u>	<u>29.3% (29)</u>	<u>49.5% (49)</u>	<u>20.2% (20)</u>	<u>1.0% (1)</u>	
<u>Unknown</u>	<u>40.6% (13)</u>	<u>53.1% (17)</u>	<u>6.3% (2)</u>	<u>0.0% (0)</u>	
<u>Previous surgical procedure</u>					
<u>None</u>	<u>34.2% (13)</u>	<u>52.6% (20)</u>	<u>10.5% (4)</u>	<u>2.6% (1)</u>	
<u>Biopsy</u>	<u>43.5% (80)</u>	<u>39.7% (73)</u>	<u>15.8% (29)</u>	<u>1.1% (2)</u>	
					<u>0.408</u>
<u>Other</u>	<u>48.1% (25)</u>	<u>46.2% (24)</u>	<u>3.8% (2)</u>	<u>1.9% (1)</u>	
<u>Unknown</u>	<u>28.6% (2)</u>	<u>42.9% (3)</u>	<u>28.6% (2)</u>	<u>0.0% (0)</u>	
<u>Total number of chemo cycles</u>					
<u>< 5 cycles</u>	<u>47.1% (88)</u>	<u>38.5% (72)</u>	<u>12.8% (24)</u>	<u>1.6% (3)</u>	
					<u>0.048*</u>
<u>5–10 cycles</u>	<u>28.2% (20)</u>	<u>54.9% (39)</u>	<u>16.9% (12)</u>	<u>0.0% (0)</u>	

<u>> 10 cycles</u>	<u>52.2%</u> <u>(12)</u>	<u>39.1% (9)</u>	<u>4.3% (1)</u>	<u>4.3% (1)</u>	
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Status of chemo treatment

<u>Complete</u>	<u>48.5%</u> <u>(32)</u>	<u>42.4%</u> <u>(28)</u>	<u>9.1% (6)</u>	<u>0.0% (0)</u>	
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<u>Incomplete</u>	<u>38.2%</u> <u>(71)</u>	<u>45.7%</u> <u>(85)</u>	<u>14.0%</u> <u>(26)</u>	<u>2.2% (4)</u>	<u>0.163</u>
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<u>Unknown</u>	<u>58.6%</u> <u>(17)</u>	<u>24.1% (7)</u>	<u>17.2% (5)</u>	<u>0.0% (0)</u>	
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Patient living without the disease

<u>Yes</u>	<u>63.6%</u> <u>(21)</u>	<u>33.3%</u> <u>(11)</u>	<u>3.0% (1)</u>	<u>0.0% (0)</u>	
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<u>No</u>	<u>40.0%</u> <u>(94)</u>	<u>44.3%</u> <u>(104)</u>	<u>14.0%</u> <u>(33)</u>	<u>1.7% (4)</u>	<u>0.164</u>
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<u>Unknown</u>	<u>38.5% (5)</u>	<u>38.5% (5)</u>	<u>23.1% (3)</u>	<u>0.0% (0)</u>	
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Local recurrence

<u>Yes</u>	<u>26.2%</u> <u>(11)</u>	<u>61.9%</u> <u>(26)</u>	<u>11.9% (5)</u>	<u>0.0% (0)</u>	
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<u>No</u>	<u>45.8%</u> <u>(87)</u>	<u>38.9%</u> <u>(74)</u>	<u>13.7%</u> <u>(26)</u>	<u>1.6% (3)</u>	<u>0.214</u>
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<u>Unknown</u>	<u>44.9%</u> <u>(22)</u>	<u>40.8%</u> <u>(20)</u>	<u>12.2% (6)</u>	<u>2.0% (1)</u>	
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Disease recurrence

<u>Yes</u>	<u>23.8%</u> <u>(20)</u>	<u>52.4%</u> <u>(44)</u>	<u>23.8%</u> <u>(20)</u>	<u>0.0% (0)</u>	<u>0.001**</u>
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<u>No</u>	<u>50.9%</u> <u>(83)</u>	<u>38.0%</u> <u>(62)</u>	<u>9.2% (15)</u>	<u>1.8% (3)</u>
<u>Unknown</u>	<u>50.0%</u> <u>(17)</u>	<u>41.2%</u> <u>(14)</u>	<u>5.9% (2)</u>	<u>2.9% (1)</u>
<u>Total</u>	<u>42.7%</u> <u>(120)</u>	<u>42.7%</u> <u>(120)</u>	<u>13.2%</u> <u>(37)</u>	<u>1.4% (4)</u>

* $p \leq 0.05$

** $p \leq 0.01$

Evidently there was **significant association** between the cancer type and age at first presentation; as well as, the gender type, the stage of cancer, and history of previous surgical procedures. **Table 4** demonstrates the significant link between cancer type and demographic data. Furthermore, little evidence showed correlation among cancer type and smoking, number of chemotherapy cycles and other factors.

Table 4: Prevalence of cancer among patients:

<u>Variables</u>	<u>Cancer Type</u>								<u>p-value</u>
	<u>Br</u> <u>eas</u> <u>t</u>	<u>Bloo</u> <u>d</u>	<u>GI</u>	<u>Res</u> <u>pira</u> <u>tory</u>	<u>Renal</u>	<u>Head</u> <u>and</u> <u>Neck</u>	<u>Genitou</u> <u>rinary</u>	<u>Gyne</u> <u>cologi</u> <u>cal</u>	
<u>Age at Diagnosis</u>									
<u>< 20</u>	<u>0</u>	<u>12</u>	<u>2</u>	<u>1</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>0</u>	
<u>20-39</u>	<u>9</u>	<u>33</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>6</u>	<u>1</u>	<u>0</u>	
<u>40-59</u>	<u>19</u>	<u>31</u>	<u>23</u>	<u>3</u>	<u>2</u>	<u>6</u>	<u>0</u>	<u>2</u>	<u>0.02</u>
<u>≥60</u>	<u>8</u>	<u>18</u>	<u>12</u>	<u>2</u>	<u>1</u>	<u>9</u>	<u>0</u>	<u>2</u>	<u>5*</u>
<u>Unknown</u>	<u>8</u>	<u>17</u>	<u>25</u>	<u>3</u>	<u>4</u>	<u>8</u>	<u>1</u>	<u>2</u>	
<u>Recent age</u>									
<u>< 20</u>	<u>0</u>	<u>10</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>0</u>	
<u>20-39</u>	<u>8</u>	<u>34</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>9</u>	<u>1</u>	<u>0</u>	<u>0.03</u>
<u>40-59</u>	<u>20</u>	<u>45</u>	<u>29</u>	<u>4</u>	<u>3</u>	<u>8</u>	<u>0</u>	<u>3</u>	<u>9*</u>
<u>≥60</u>	<u>16</u>	<u>22</u>	<u>29</u>	<u>4</u>	<u>3</u>	<u>13</u>	<u>1</u>	<u>3</u>	

Sex

<u>Male</u>	<u>1</u>	<u>57</u>	<u>38</u>	<u>5</u>	<u>7</u>	<u>15</u>	<u>2</u>	<u>0</u>	<u>0.001**</u>
<u>Female</u>	<u>43</u>	<u>54</u>	<u>28</u>	<u>5</u>	<u>2</u>	<u>18</u>	<u>0</u>	<u>6</u>	
<u>Nationality</u>									
<u>Saudi</u>	<u>44</u>	<u>109</u>	<u>64</u>	<u>10</u>	<u>9</u>	<u>33</u>	<u>2</u>	<u>6</u>	<u>0.900</u>
<u>Non Saudi</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	
<u>History of smoking</u>									
<u>Yes</u>	<u>1</u>	<u>13</u>	<u>9</u>	<u>0</u>	<u>2</u>	<u>5</u>	<u>0</u>	<u>0</u>	<u>0.262</u>
<u>No</u>	<u>41</u>	<u>96</u>	<u>54</u>	<u>10</u>	<u>7</u>	<u>24</u>	<u>2</u>	<u>6</u>	
<u>Unknown</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>0</u>	
<u>Stage</u>									
<u>Stage 1</u>	<u>3</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>2</u>	<u>0.001**</u>
<u>Stage 2</u>	<u>12</u>	<u>39</u>	<u>11</u>	<u>1</u>	<u>0</u>	<u>5</u>	<u>1</u>	<u>0</u>	
<u>Stage 3</u>	<u>9</u>	<u>21</u>	<u>11</u>	<u>1</u>	<u>1</u>	<u>9</u>	<u>0</u>	<u>3</u>	
<u>Stage 4</u>	<u>17</u>	<u>19</u>	<u>36</u>	<u>7</u>	<u>7</u>	<u>12</u>	<u>1</u>	<u>0</u>	
<u>Unknown</u>	<u>3</u>	<u>20</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>4</u>	<u>0</u>	<u>1</u>	
<u>Previous surgical procedure</u>									
<u>Non</u>	<u>4</u>	<u>11</u>	<u>14</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>0</u>	<u>1</u>	<u>0.001**</u>
<u>Biopsy</u>	<u>32</u>	<u>87</u>	<u>32</u>	<u>3</u>	<u>4</u>	<u>20</u>	<u>1</u>	<u>5</u>	
<u>Other</u>	<u>8</u>	<u>9</u>	<u>18</u>	<u>6</u>	<u>3</u>	<u>8</u>	<u>0</u>	<u>0</u>	
<u>Unknown</u>	<u>0</u>	<u>4</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	
<u>Total number of chemo cycles</u>									
<u>< 5 cycles</u>	<u>26</u>	<u>74</u>	<u>40</u>	<u>7</u>	<u>7</u>	<u>28</u>	<u>2</u>	<u>3</u>	<u>0.147</u>
<u>5-10 cycles</u>	<u>16</u>	<u>30</u>	<u>15</u>	<u>2</u>	<u>1</u>	<u>4</u>	<u>0</u>	<u>3</u>	
<u>> 10 cycles</u>	<u>2</u>	<u>7</u>	<u>11</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	

Status of chemo treatment

<u>Complete</u>	<u>11</u>	<u>25</u>	<u>15</u>	<u>4</u>	<u>3</u>	<u>6</u>	<u>1</u>	<u>1</u>	
<u>Incomplete</u>	<u>27</u>	<u>81</u>	<u>44</u>	<u>6</u>	<u>5</u>	<u>18</u>	<u>1</u>	<u>4</u>	<u>0.149</u>
<u>Unknown</u>	<u>6</u>	<u>5</u>	<u>7</u>	<u>0</u>	<u>1</u>	<u>9</u>	<u>0</u>	<u>1</u>	

Patient living without the disease

<u>Yes</u>	<u>7</u>	<u>11</u>	<u>11</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>1</u>	
<u>No</u>	<u>35</u>	<u>97</u>	<u>51</u>	<u>9</u>	<u>8</u>	<u>29</u>	<u>2</u>	<u>4</u>	<u>0.753</u>
<u>Unknown</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>1</u>	

Local recurrence

<u>Yes</u>	<u>5</u>	<u>23</u>	<u>6</u>	<u>4</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>0</u>	
<u>No</u>	<u>31</u>	<u>75</u>	<u>48</u>	<u>3</u>	<u>5</u>	<u>22</u>	<u>2</u>	<u>4</u>	<u>0.069</u>
<u>Unknown</u>	<u>8</u>	<u>13</u>	<u>12</u>	<u>3</u>	<u>4</u>	<u>7</u>	<u>0</u>	<u>2</u>	

Distant recurrence

<u>Yes</u>	<u>14</u>	<u>17</u>	<u>32</u>	<u>5</u>	<u>7</u>	<u>7</u>	<u>0</u>	<u>2</u>	
<u>No</u>	<u>28</u>	<u>78</u>	<u>28</u>	<u>3</u>	<u>2</u>	<u>19</u>	<u>2</u>	<u>3</u>	<u>0.001**</u>
<u>Unknown</u>	<u>2</u>	<u>16</u>	<u>6</u>	<u>2</u>	<u>0</u>	<u>7</u>	<u>0</u>	<u>1</u>	
Total	<u>44</u>	<u>111</u>	<u>66</u>	<u>10</u>	<u>9</u>	<u>33</u>	<u>2</u>	<u>6</u>	

* $p \leq 0.05$ ** $p \leq 0.01$ **RESULTS SUMMARY:**

1. Generally, blood malignancies were the most common with 111 patients (39.5%) being detected with it, followed by 66 patients (23.5%) with GI cancer, 44 patients (15.7%) with breast cancer and 33 patients (11.7%) with head and neck cancer.
2. 99 patients (35.2%) had a stage 4 cancer and 69 patients (24.6%) had stage 2 cancer.
3. 184 patients (65.5%) received biopsy as a previous surgical procedure.
4. 187 patients (66.5%) received a total number of chemo cycles <5 cycles.

5. 186 patients (66.2%) did not complete the chemo treatment and 66 patients (23.5%) completed the chemo treatment.
6. 235 patients (83.6%) were not alive without the disease and 33 patients (11.7%) were living without the disease.
7. 190 patients (67.6%) had no local recurrence of the disease.
8. 163 patients (58.0%) had no distant recurrence and 84 patients (29.9%) had distant recurrence of the disease.
9. There was a **statistically significant association** between PHQ9 and a total number of chemo cycles. (p-value = 0.012)
10. Age at First Diagnosis of Cancer, recent age, sex, nationality, history of smoking, cancer type, stage, previous surgical procedure, status of chemo treatment, patient living without the disease, local recurrence and distant recurrence reported **no significant association** with PHQ9 score levels that all p-values were > 0.05.
11. Age at first diagnosis of cancer, total number of chemo cycles and distant recurrence reported **statistically significant association** with degrees of difficulty in coping with depression that p-values were 0.016, 0.048 and 0.001, respectively.
12. Recent age, sex, nationality, history of smoking, cancer type, stage of cancer, previous surgical procedure, status of chemo treatment, patient living without the disease and local recurrence reported **no significant association** with degrees of difficulty in coping with depression that all p-values were > 0.05.
13. Age at first diagnosis of cancer, recent age, sex, stage, previous surgical procedure and distant recurrence reported **statistically significant association** with cancer type with p-values of 0.025, 0.039, 0.001, 0.001, 0.001 and 0.001, respectively.
14. Nationality, history of smoking, total number of chemo cycles, status of chemo treatment, patient living without the disease and local recurrence, reported **no significant association** with cancer type that all p-values were > 0.05.

DISCUSSION:

Depression is common among cancer patients and can affect the adherence to treatment and the quality of life. This study was performed to assess the incidence of depression among the cancer population in Saudi Arabia. Our study targeted all ages, including sex, type and stage of cancer at diagnosis and surgical procedures that were performed throughout the diagnosis.

The study found that males had a higher prevalence of developing depression compared to female, with the highest incidence in the 7th decade and older, as older people have a higher risk of metastasis and lower tolerance to treatment.

Renal cancer patients had the highest risk of depression, followed by genitourinary and breast cancer patients.

This study showed that the frequency of depression is significantly associated with the number of chemotherapy cycles and the risk of local or distant recurrence.

Although smoking has a significant effect on developing the majority of comorbidities, we found no significant relationship between smoking and the possibility of developing depression in cancer patients.

Depression consists of various mood disorders, ranging from negative mood symptoms, poor concentration sleep disturbance to severe symptoms of hallucinations and delusions. Therefore, patients were classified according to their symptoms and severity of depression. Fortunately, we found that most patients were suffering from mild depressive mood disorders and a minority reached advanced stages of depression.

Depression has a major role in the prognosis and survival of cancer patients. Early detection of depression leads to a better prognosis, longer survival and good quality of life.

CONCLUSION:

The results suggest that although many factors may cause depression among cancer patients, the most important factor is the number of chemotherapy cycles. (p-value = 0.012). Additionally, in our sample size and based on the analysis of PHQ9 scores, only 95 patients (33.8%) were not depressed with the remaining patients suffered from various degrees of depression. The majority of patients had mild depression 112 patients (39.9%).

Early detection of depression is essential to enhance compliance and prognosis. However, further research is necessary to develop a standardized approach to mitigate depression among cancer patients.

Compliance and ethical standards:

Conflict of interest: The authors declare that they have no conflicts of interest.

Informed consent: All participants were adequately informed about the study and its implications and agreed to participate in the study.

Ethical approval: This study was approved by the Institutional Review Board (IRB) of King Abdullah International Medical Research Center (KAIMRC).

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