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# Welcome

On behalf of the Johns Hopkins Aramco Healthcare (JHAH) Oncology Institute, I am pleased to present the 2017 Oncology Institute Annual Review. The data in this review come from the JHAH Tumor Registry and is used for hospital and administrative planning and for allocating and utilizing health resources.

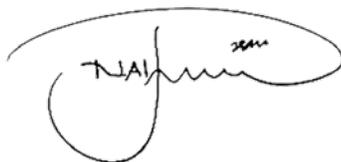
The mission of the JHAH Oncology Institute is to provide excellent cancer treatment, education and research. The institute has evolved over the years as it works toward its vision of becoming one of the best international centers for cancer prevention and treatment.

JHAH cancer patients are assessed using a multidisciplinary approach and are treated with the most advanced, evidence-based modalities, including radiation therapy, chemotherapy, autologous stem cell transplantation and palliative care. It is only through this continued caring, dedication and team effort that JHAH will continue to provide world-class cancer care and remarkable patient experience.

I want to personally acknowledge the work and support of our dedicated physicians, nurses and hospital staff and want to express my gratitude to the tumor registry staff for their tremendous effort and commitment and for producing this annual review.

I hope you find the information in this review useful.

Dr. Nafeesa Al-Faris

A handwritten signature in black ink, appearing to read 'N. Al-Faris', enclosed within a large, stylized oval flourish.

*Chair, Oncology Institute*

# Oncology Institute

The Oncology Institute is a key service line that is based on three fundamental drivers: quality clinical outcomes, academic excellence and oncology education, recently becoming a Ministry of Health Oncology and Hematology Fellowship Program site.

## Mission

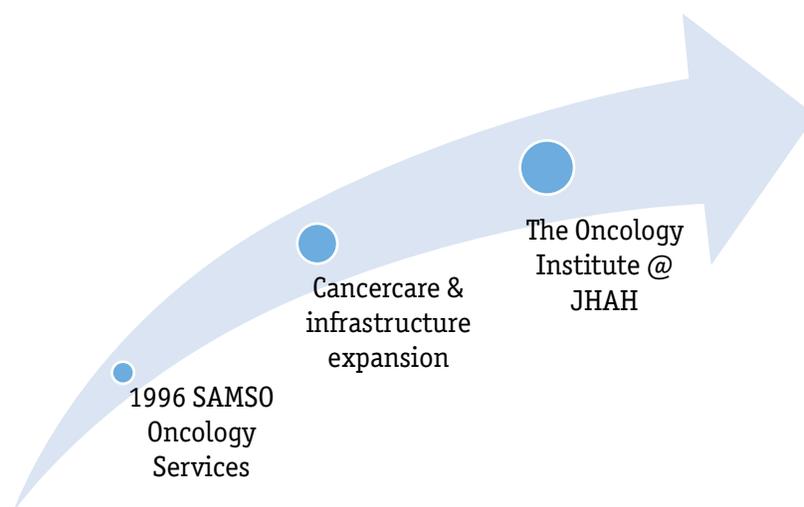
To improve the health of the community by providing high quality, multidisciplinary, comprehensive clinical care for oncology diseases and blood disorders.

## Vision

To be a leader in clinical quality, research and education in the Kingdom of Saudi Arabia.

The institute is structured to be more than a place to treat cancer. The institute comprises comprehensive cancer care (cancercare), radiation oncology and a blood disorders center that provide advanced treatments, bone marrow transplants, advanced radiation oncology services, palliative care as well as a tumor registry. The team provides inpatient and outpatient services, the latest in chemotherapy and hormone therapy, a wide range of diagnostic and therapeutic procedures and radiotherapy treatments.

Oncology services began in the late 1990s with the Saudi Aramco Medical Services Organization and has progressed over the years. Now as part of JHAH, the service has become the Oncology Institute, which is recognized locally, regionally and internationally.



# *Tumor Registry Unit*

The JHAH Tumor Registry uses an information system that is designed for the collection, management and analysis of information of patients diagnosed with cancer.

The unit began collecting this information in 1987. It is a hospital-based registry that collects data from all medical organizations within the JHAH system, including its network of providers. The registry reports its data to the Saudi Cancer Registry in the Saudi Arabian Ministry of Health. The registry's database currently holds about 13,000 cases.

The registry contains a wide range of information including the following:

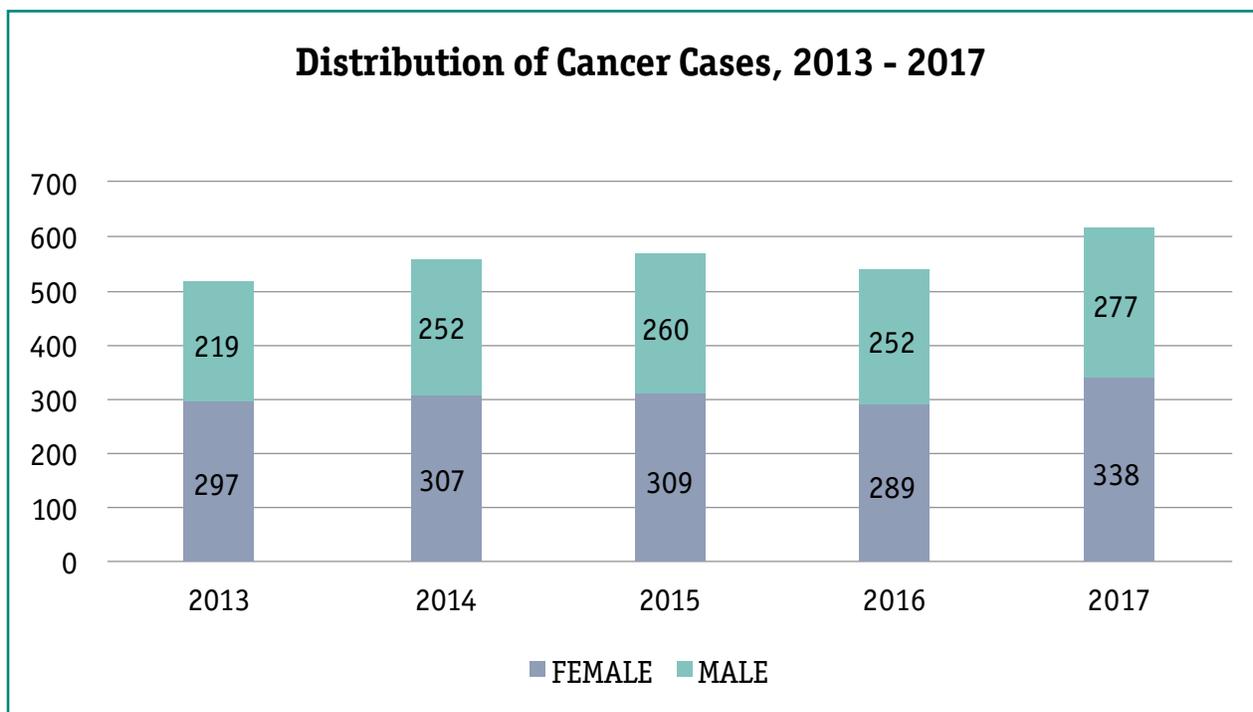
- Patient demographics, age, gender and nationality
- Medical history, physical findings and screening information
- Diagnostic information including relevant dates and diagnostic procedure(s)
- Tumor information including primary site (Topography), cell type (Histology), behavior and extent of disease
- Type of therapies, i.e., surgery, chemotherapy, radiotherapy, hormone and immunotherapy
- Follow-up information including patient status, cancer status, last date of contact and death when appropriate

# JHAH Cancer Population

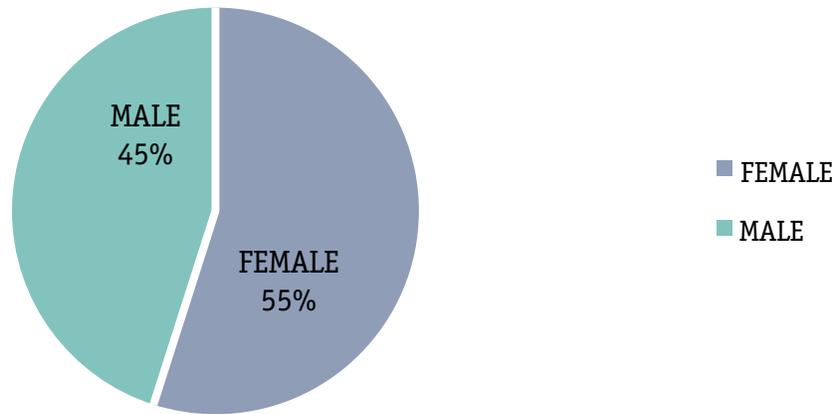
From January 1 through December 31, 2017, there were 615 new cases recorded in the registry, the highest number recorded in a single year. Of these, 55% were female and 45% were male. Saudi nationals constituted 91% of the cases with 9% being patients from other countries.

The largest number of cases was reported in the 50-59 age group. At the time of diagnosis, 20% were metastasized, 28% presented as a regional disease and 43% were localized tumors.

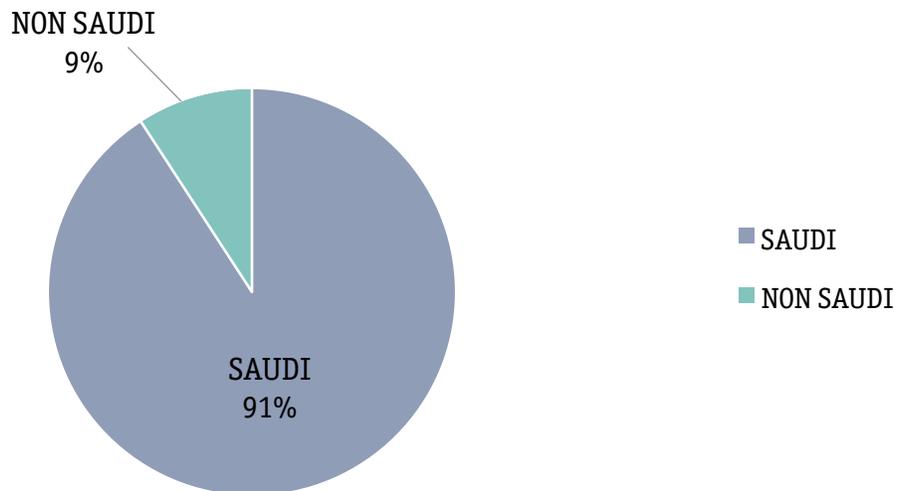
Among new cases diagnosed or treated in 2017, 14% of the patients died, the majority with advanced disease at presentation; 48% were alive and in remission, the majority of these cases presented initially as localized disease; and 36% were still with persistent disease and under treatment.

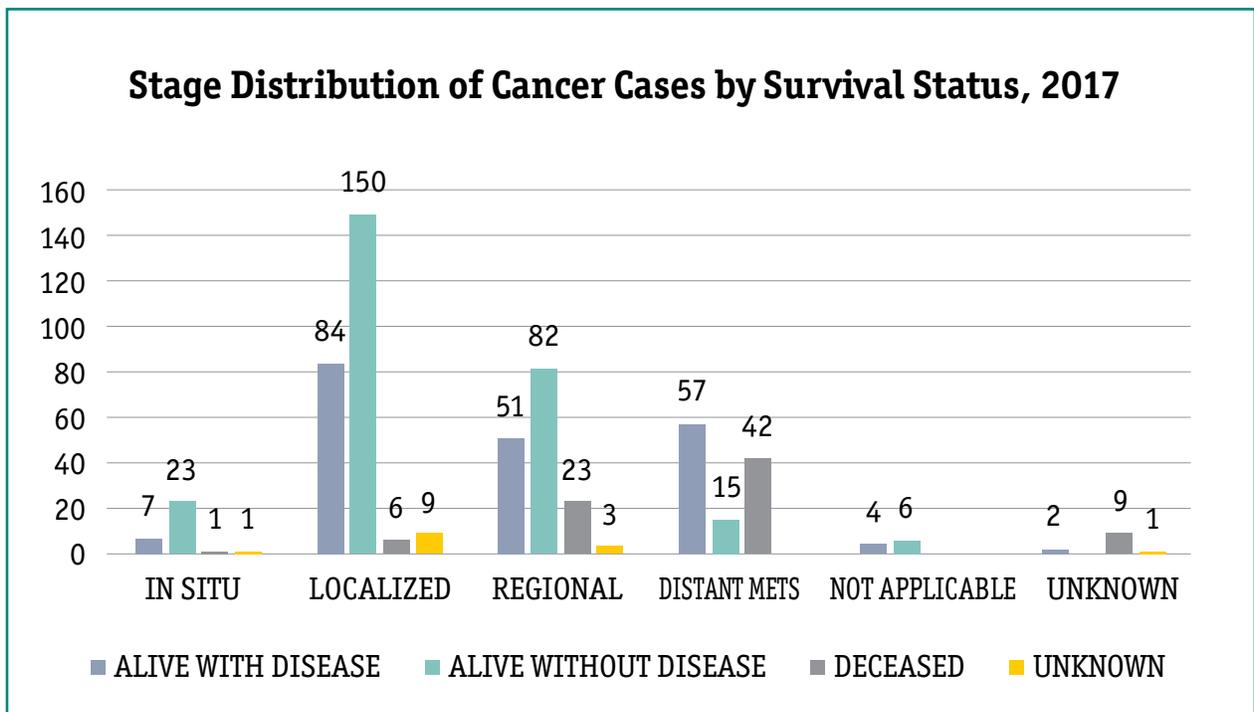
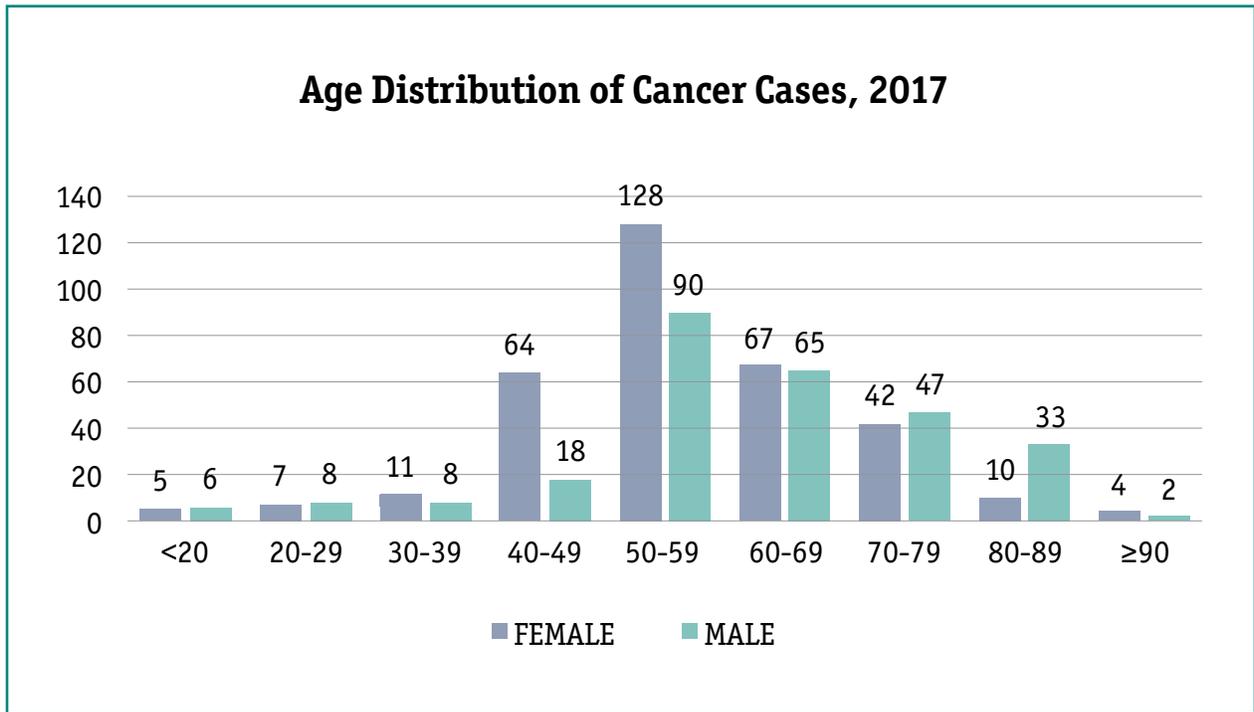


### Gender Distribution of Cancer Cases, 2017



### Saudi Cancer Cases, 2017





*Note: Leukemia cases were excluded from this table as its stage is always a systemic disease.*

## All Cases

Primary Site	Total	%
Breast	119	19%
Colorectal	100	16%
Hematopiotics	73	12%
Prostate Gland	43	7%
Thyroid Gland	42	7%
Lung	29	5%
Female Genital	28	5%
Skin	25	4%
GI Non Colorectal	25	4%
CNS	24	4%
Kidney	21	3%
Urinary Bladder	20	3%
Liver	18	3%
Pancreas	13	2%
Head & Neck	13	2%
Unknown	5	1%
Soft Tissue & Bone	5	1%
Male Genital	3	0.5%
Biliary Duct	3	0.5%
Thymus	2	0.3%
Adrenal Gland	1	0.2%
Parotid Gland	1	0.2%
Pleura Parietal	1	0.2%
Abdomen	1	0.2%
<b>Total</b>	<b>615</b>	

*Note: There were 32 cases of basal cell carcinoma diagnosed and treated in 2017. They are not included in the table because basal cell carcinoma is not recorded by the Saudi Cancer Registry as it is rare in the Saudi population.*

## Cancer Incidents by Gender

Female		
Primary Site	Total	%
Breast	119	35%
Colorectal	55	16%
Hematopiotics	34	10%
Genital	28	8%
Thyroid Gland	26	8%
CNS	14	4%
Skin	12	4%
GI Non Colorectal	11	3%
Kidney	9	3%
Lung	6	2%
Liver	6	2%
Head & Neck	6	2%
Pancreas	4	1%
Unknown	4	1%
Soft Tissue & Bone	1	0.3%
Biliary Duct	1	0.3%
Thymus	1	0.3%
Parotid Gland	1	0.3%
<b>Total</b>	<b>338</b>	

## Cancer Incidents by Gender

Male		
Primary Site	Total	%
Colorectal	45	16%
Prostate Gland	43	16%
Hematopiotics	39	14%
Lung	23	8%
Urinary Bladder	20	7%
Thyroid Gland	16	6%
GI Non Colorectal	14	5%
Skin	13	5%
Kidney	12	4%
Liver	12	4%
CNS	10	4%
Pancreas	9	3%
Head & Neck	7	3%
Soft Tissue & Bone	4	1%
Genital	3	1%
Biliary Duct	2	1%
Unknown	1	0.4%
Thymus	1	0.4%
Adrenal Gland	1	0.4%
Pleura Parietal	1	0.4%
Abdomen	1	0.4%
<b>Total</b>	<b>277</b>	

# Five Most Common Cancers 2017

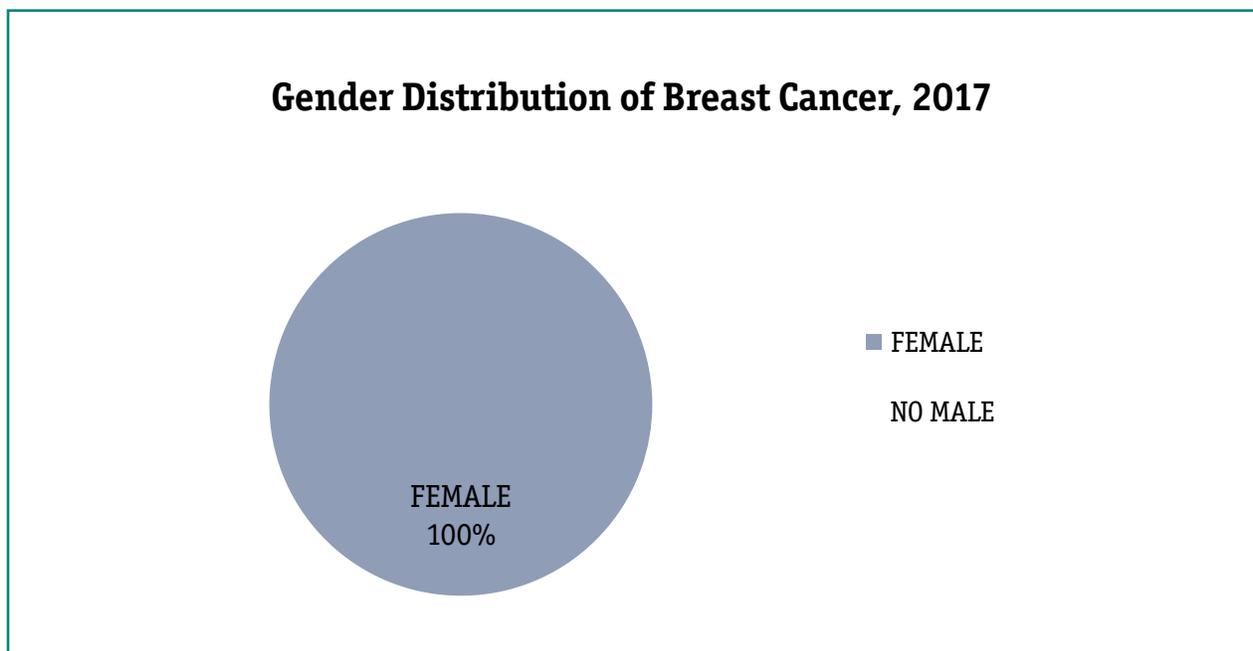
## 1. Breast Cancer

Breast cancer was the most frequent cancer diagnosed or treated at JHAH. The 119 registered cases represent 19.3% of all newly diagnosed cancers in 2017. Most were diagnosed in the 50-59 age group. There were no male breast cancer cases.

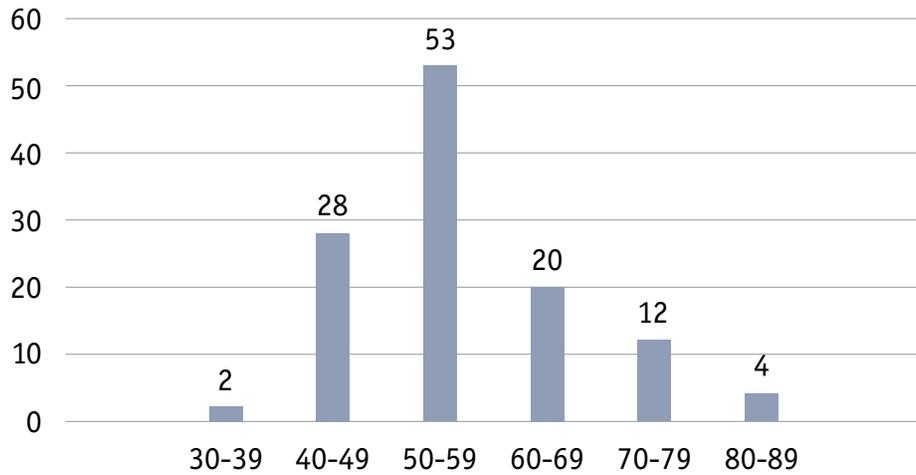
At 78% of all cases, invasive ductal carcinoma was the most predominant histological type followed by invasive lobular carcinoma at 9%. Mixed histology was reported in two cases, and invasive papillary carcinoma was reported in one. Noninvasive cancers represented 7% of all cases.

Stage at diagnosis was reported for all cases (100%) as follows: in situ tumors 7%, localized tumors 45%, regional tumors 39% and distant metastases 9%. Among new cases of breast cancer diagnosed or treated, 2.5% died (all with advanced disease at presentation), 66% were in remission (the majority presenting as localized or regional), 29% were under treatment and 2.5% were unknown.

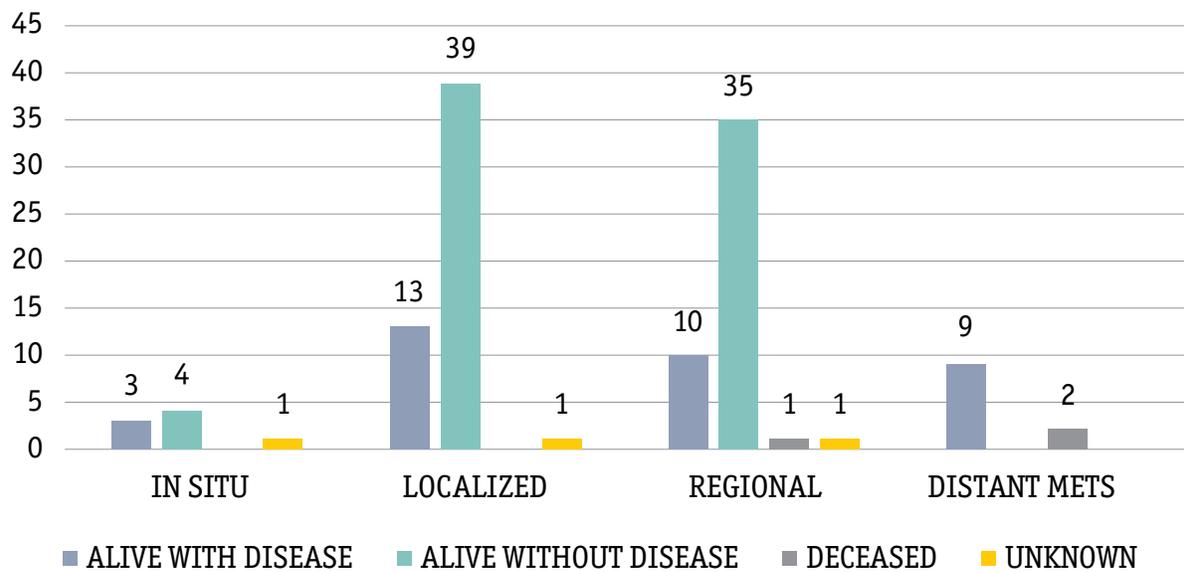
Breast cancer cases diagnosed or treated at JHAH were first detected by screening mammography in 48% of the cases, patient self-detected in 39% of the cases and as a result of a physician referral in 8% of the cases.

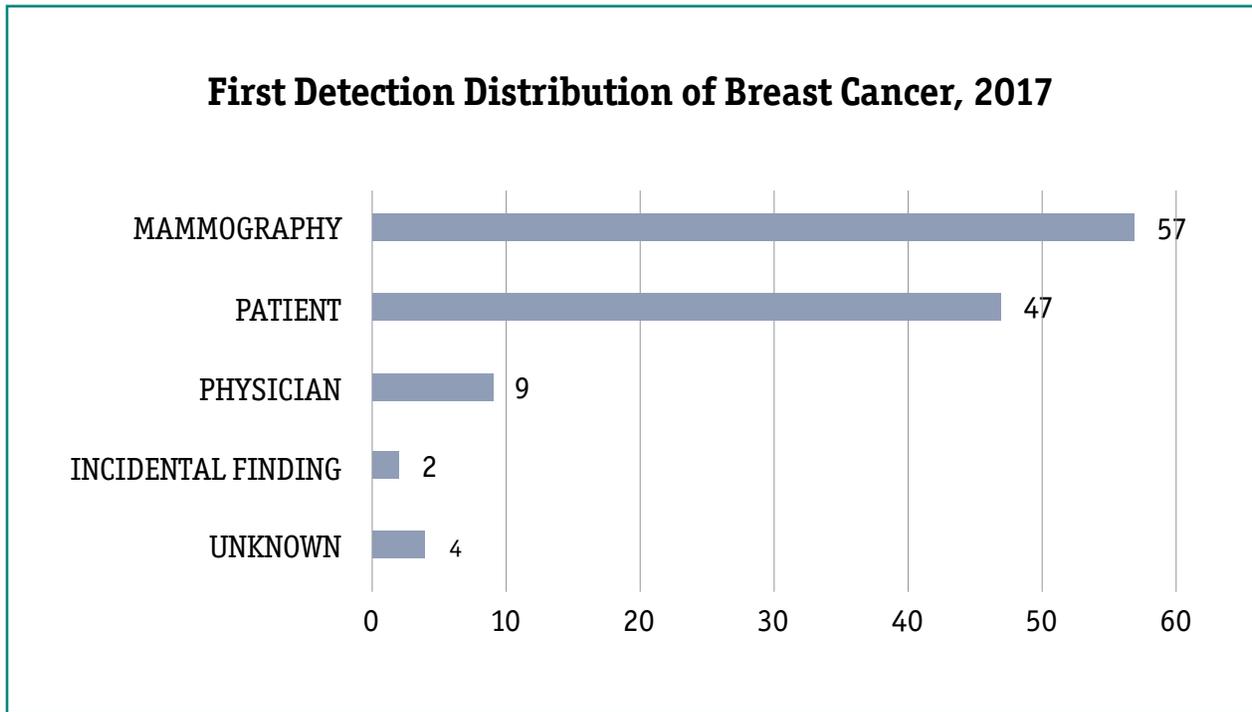


### Age Distribution of Breast Cancer, 2017



### Stage Distribution of Breast Cancer by Survival Status, 2017





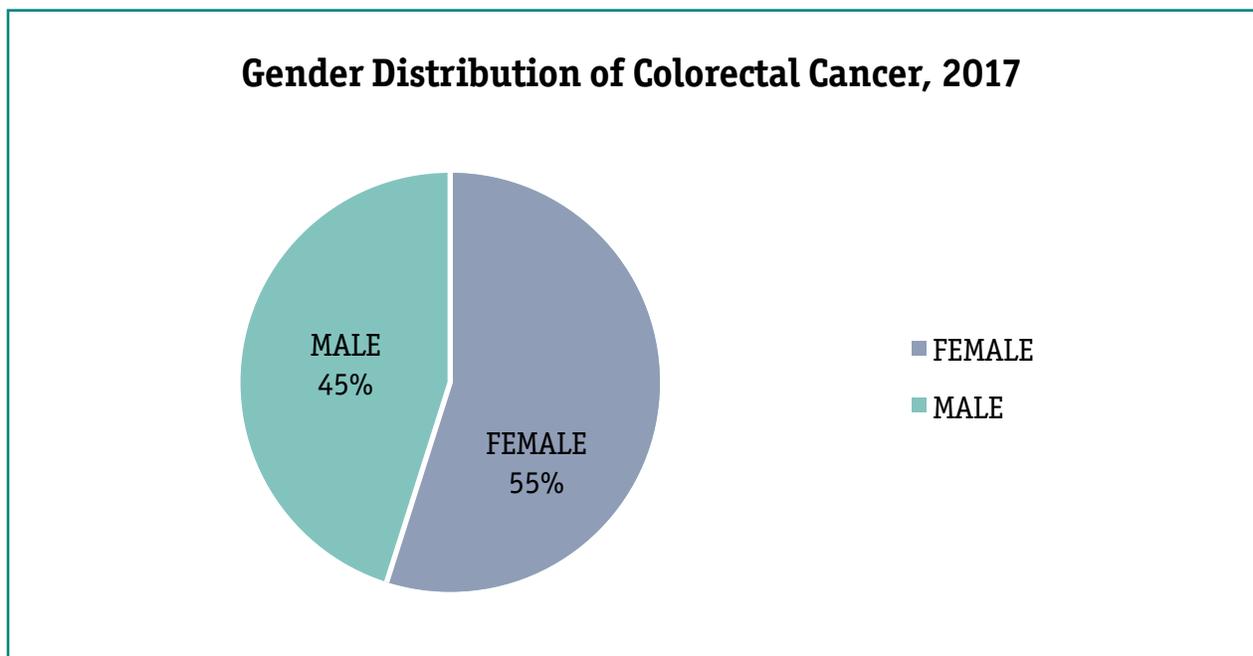
### Morphological Distribution of Breast Cancer, 2017

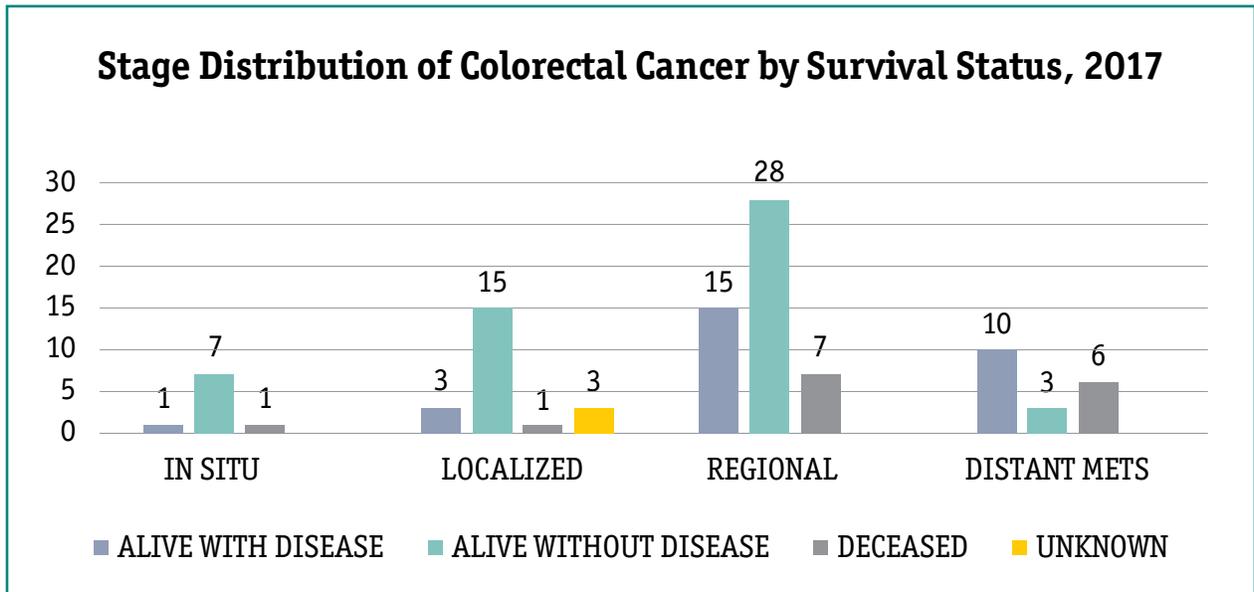
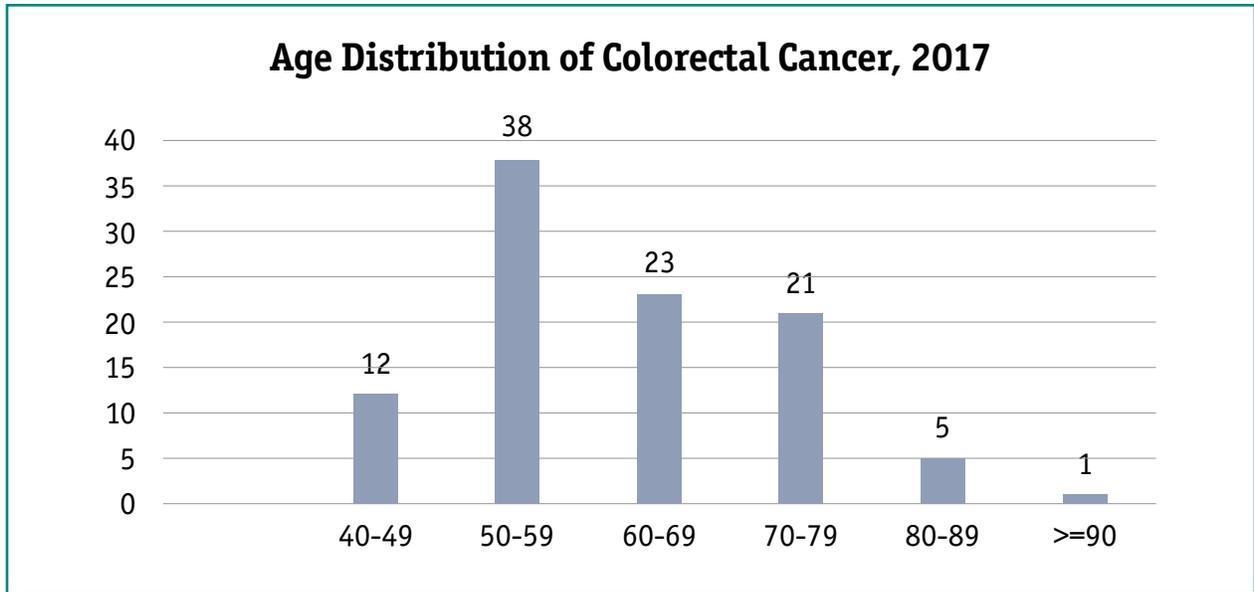
Morphology	Total	%
<b>Non Invasive</b>		
Ductal Carcinoma	6	5%
Lobular Carcinoma	2	2%
<b>Invasive</b>		
Ductal Carcinoma	93	78%
Lobular Carcinoma	11	9%
Duct And Lobular Carcinoma	2	2%
Papillary Carcinoma	1	1%
<b>Other</b>		
Small Cell Carcinoma	2	2%
Carcinoma	2	2%
<b>Total</b>	<b>119</b>	

## 2. Colo-rectal Cancer

JHAH recorded 100 new cases of colo-rectal cancer in 2017, which accounted for about 16% of all new cancer cases. Colo-rectal cancer was the number one cancer in males and number two cancer in females in our hospital. Fifty-five percent were female and 45% were male, and 61% were in the 50-70 age group.

Of the total, 59% of the cases affected the colon, 35% the rectum and 6% were recto sigmoid. Fifty percent (50%) were diagnosed after the cancer spread to direct extension and/or the lymph nodes (regional). Thirty-one percent (31%) were local or in situ, while 19% were metastatic at the time of diagnosis. Across all stages at the end of the 2017, 53% were alive without disease, 29% alive with disease and 15% deceased.





## Morphological Distribution of Colorectal Cancer, 2017

Morphology	Total	%
Adenocarcinoma	82	82%
Adenocarcinoma In Situ	10	10%
Mucinous Adenocarcinoma	4	4%
Malignant NOS	2	2%
Carcinoid Tumor	1	1%
Signet Ring Cell Carcinoma	1	1%
<b>Total</b>	<b>100</b>	

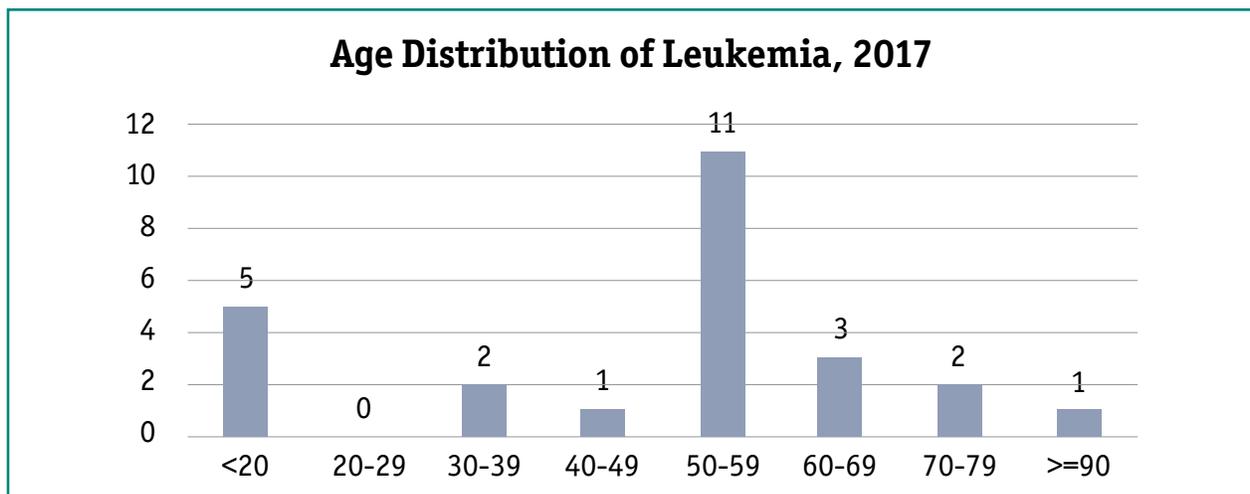
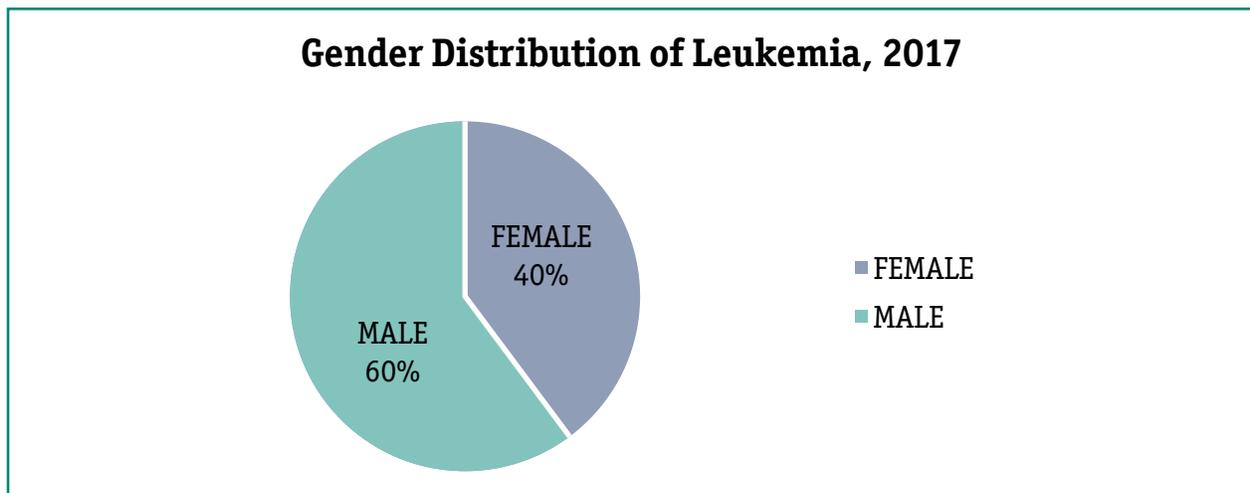
### 3. Hematopoietic

#### Leukemia

According to a 10 year GCC cancer incidence report, leukemia is the 4<sup>th</sup> most common cancer in the Arabian Gulf region accounting for 6.8% of all cancer cases<sup>1</sup>. In 2017, it ranked 8<sup>th</sup> at JHAH with 25 cases.

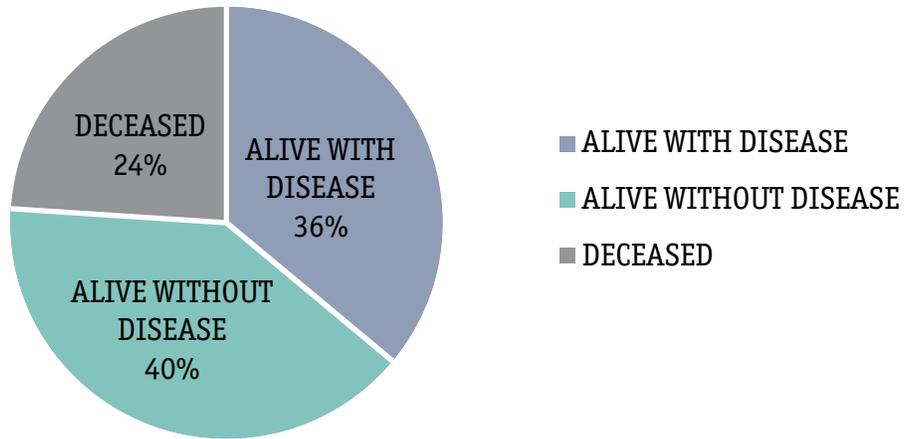
As with national and GCC cancer registries, the age and gender distributions in the JHAH registry match regional demographics. More males (60%) were diagnosed with leukemia than females (40%), and there were two age peaks: childhood leukemia (under the age of 20), mostly acute lymphoblastic leukemia; and a mix of all subtypes in the 50-59 age group.

Only one case was diagnosed with the most curable subtype-acute promyelocytic leukemia. Acute leukemia constituted more than half of the leukemia cases; this explains why the survival without disease rate was only 40%.



<sup>1</sup>Ten-Year Cancer Incidence AMONG NATIONALS OF THE GCC STATES 2007-1998, Gulf Center for Cancer Control and Prevention, September 2011.

### Survival Distribution of Leukemia, 2017

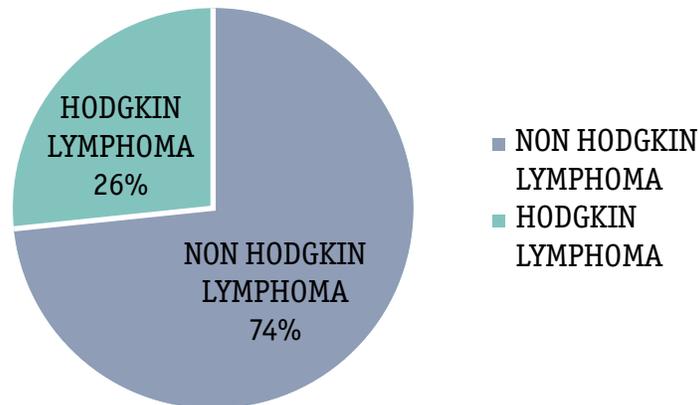


### Morphological Distribution of Leukemia, 2017

Morphology	Total	%
Acute Myeloid Leukemia	12	48%
B Cell Lymphoblastic Leukemia	7	28%
Chronic Myeloid Leukemia	5	20%
Acute Promyelocytic Leukemia	1	4%
<b>Total</b>	<b>25</b>	

## Lymphoma

### Subtype Distribution of Lymphoma, 2017

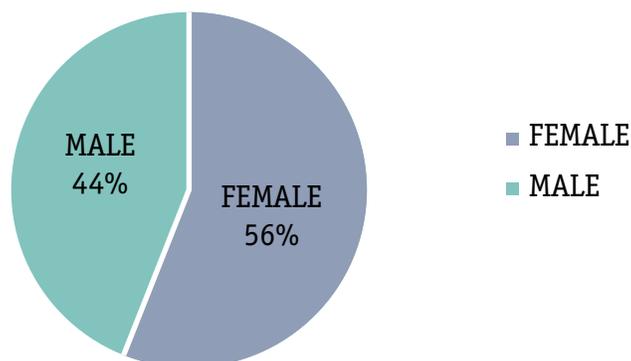


### Non Hodgkin Lymphoma (NHL)

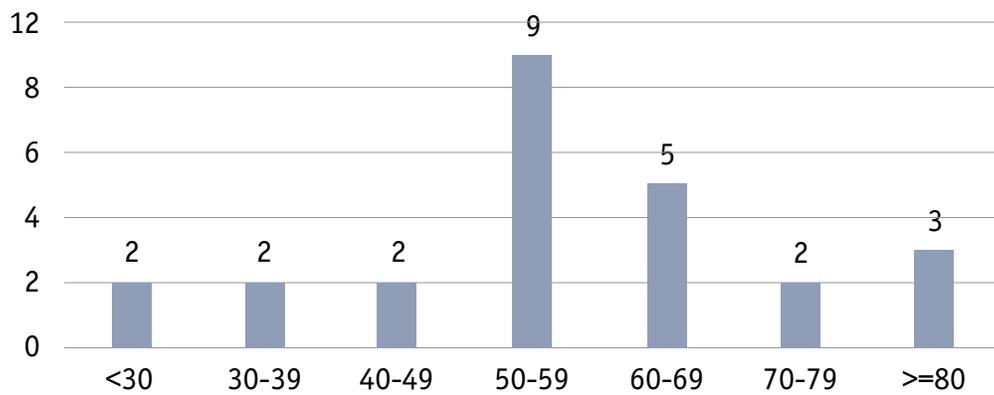
The demographic age and gender distributions of the 25 NHL cases at JHAH match GCC regional data; however, there is a predominance of follicular lymphoma diagnoses (40%), which likely reflects referral pattern rather than disease demographic.

The outcome of therapy was not promising as only 36% of NHL patients were alive and disease-free. This is likely a reflection of two high risk factors. One is age. Forty percent (10 out of the 25 cases) of the patients were over 60. The other is stage at diagnosis. More than 50% of the patients had advanced stage disease at diagnosis (designated as metastatic). Twenty-four percent (24%) of the cases were localized. This is the group that was most likely to be cured. Four out of the six cases (66%) continued to have disease.

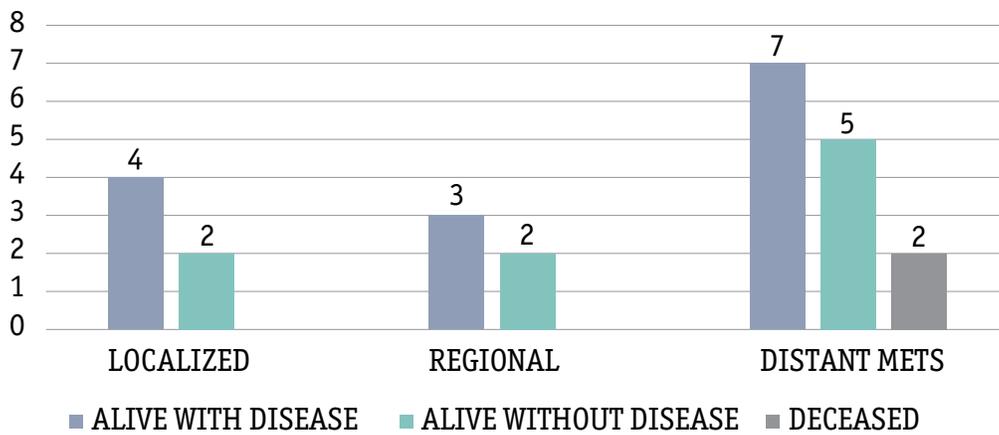
### Gender Distribution of Non Hodgkin Lymphoma, 2017



### Age Distribution of Non Hodgkin Lymphoma, 2017



### Stage Distribution of Non Hodgkin Lymphoma by Survival Status, 2017



### Morphological Distribution of Non Hodgkin Lymphoma, 2017

Morphology	Total	%
Follicular Lymphoma	10	40%
Diffuse Large B Cell	7	28%
Non Hodgkin Lymphoma NOS	2	8%
Cutaneous T Cell	1	4%
Lymphoplasmacytic Lymphoma	1	4%
Marginal Zone B Cell	1	4%
Mycosis Fungoides	1	4%
T Lymphoblastic Lymphoma	1	4%
Small Lymphocytic B Cell	1	4%
<b>Total</b>	<b>25</b>	

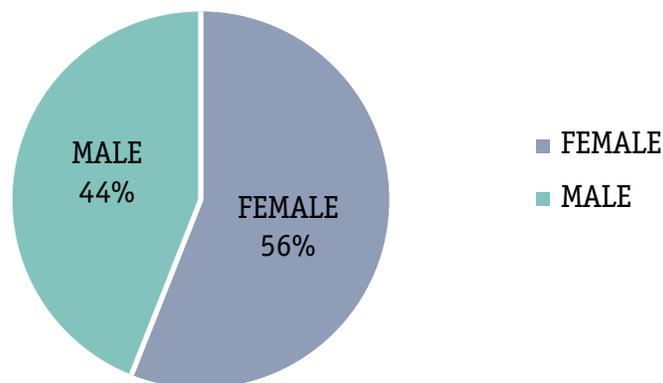
## Hodgkin Lymphoma (HL)

Research indicates that HL typically has a bimodal age distribution with a peak in the 15-34 age group and another in those older than 55. In 2017, data showed a uniform age distribution without peaks. The small number of cases (9) limits the ability to make firm conclusions; however, 2/3 (67%) of the cases were advanced (stages III and IV), which reflects a higher disease burden at time of diagnosis and a disease pattern that deserves attention in the years to come.

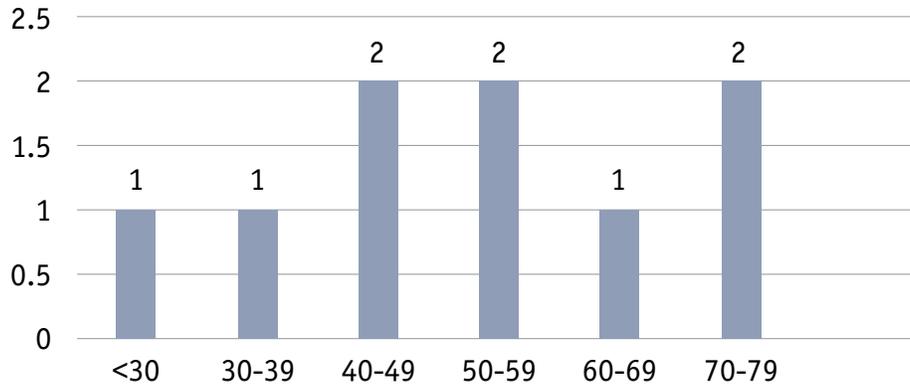
Similar to the pathology distribution of industrialized countries, our data show a predominance of the nodular sclerosis subtype (44%). Nodular lymphocyte predominant (NLPHL) is a unique HL sub entity that has a more indolent disease pattern. In 2017, two out of nine (22%) HL cases were of this category, which is higher than expected but still a small number.

Survival was higher in limited stage (Regional) HL as all three cases were alive and disease-free at the end of 2017, while only four out of the six advanced HL cases (designated as metastatic) were alive and disease-free.

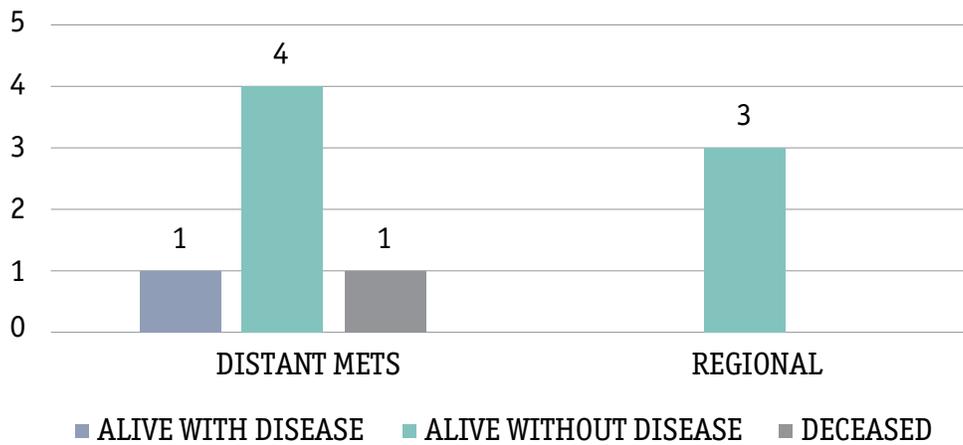
### Gender Distribution of Hodgkin Lymphoma, 2017



### Age Distribution of Hodgkin Lymphoma, 2017



### Stage Distribution of Hodgkin Lymphoma by Survival Status, 2017



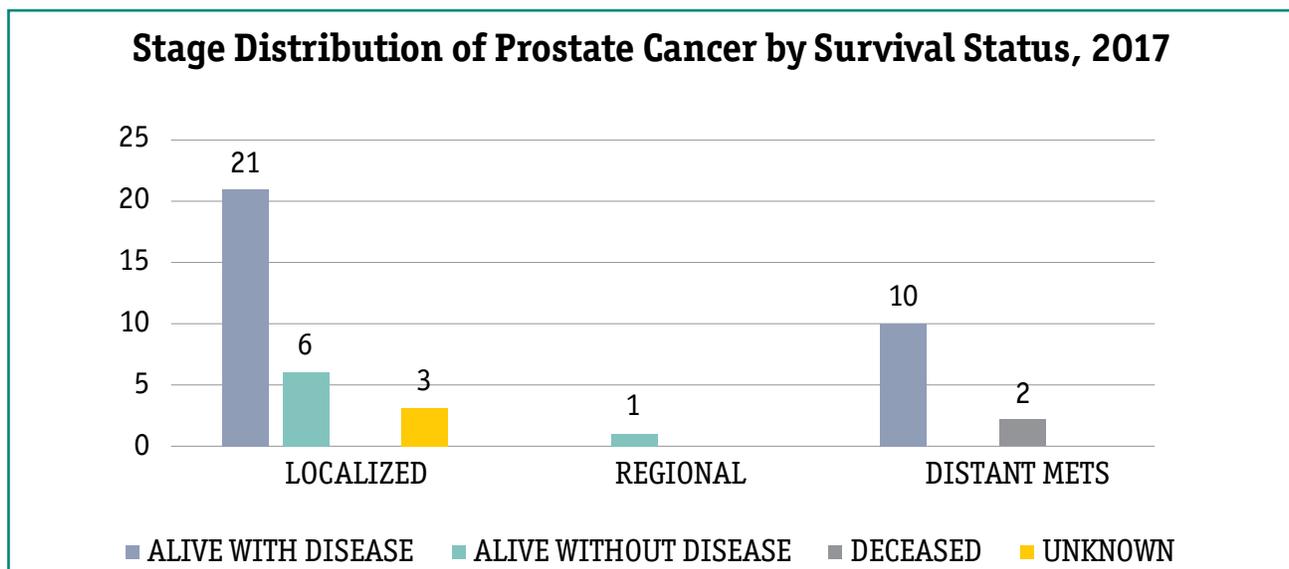
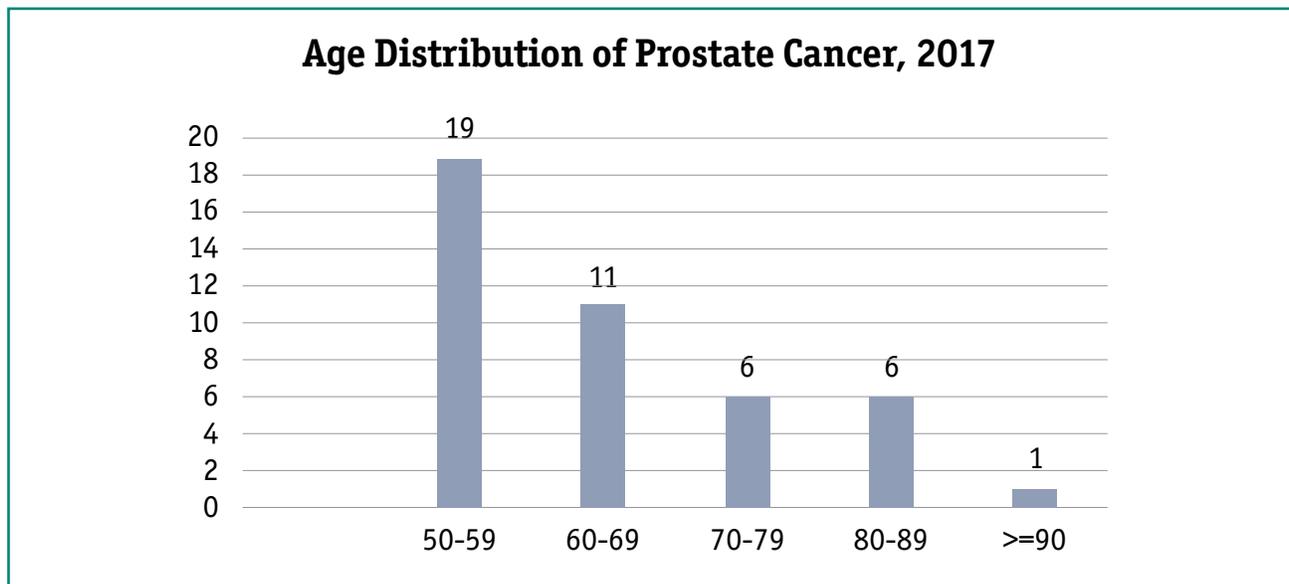
### Morphological Distribution of Hodgkin Lymphoma, 2017

Morphology	Total	%
Nodular Sclerosis	4	44.5%
Mixed Cellularity	2	22.2%
Nodular Lymphocyte Predominance	2	22.2%
Hodgkin Lymphoma NOS	1	11.1%
<b>Total</b>	<b>9</b>	

## 4. Prostate Cancer

Forty-three cases (43) of prostate cancer were diagnosed in 2017. The majority were localized, and 28% had distant metastasis. Approximately half of the diagnoses were patients in the 50-59 age group. All of the patients with localized and regional disease remained alive at year's end. Some had no evidence of disease while others continued to receive treatment. The fact that 70% had localized disease reflects the importance of screening; however, the fact that 28% of the 2017 cases had distant metastasis at diagnosis highlights a need to increase awareness of the importance of early screening.

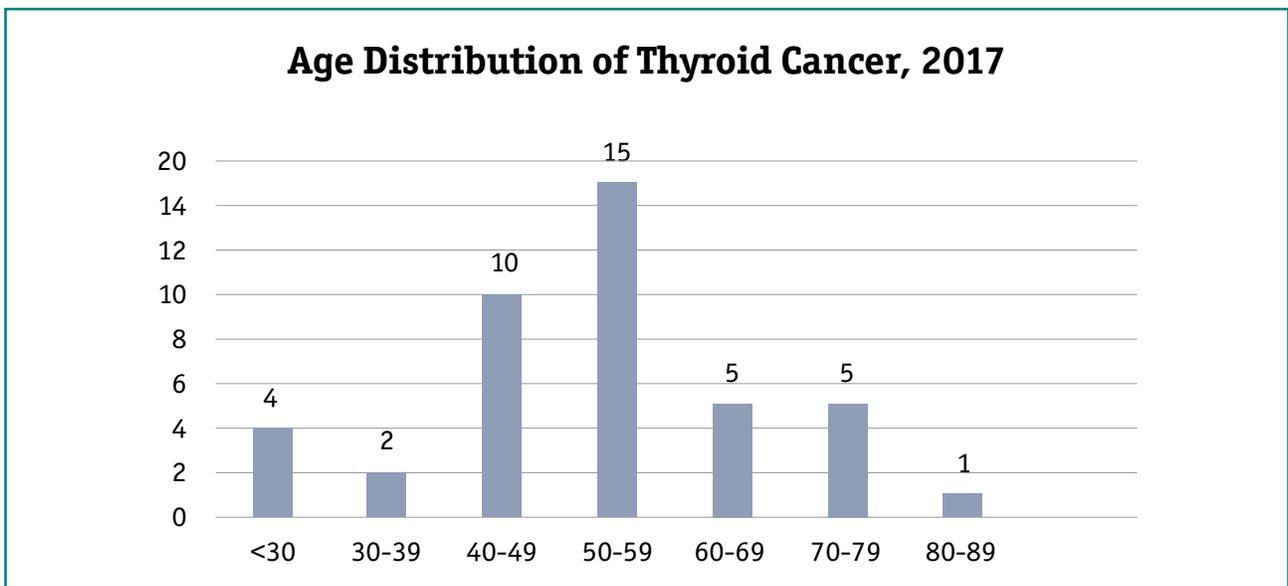
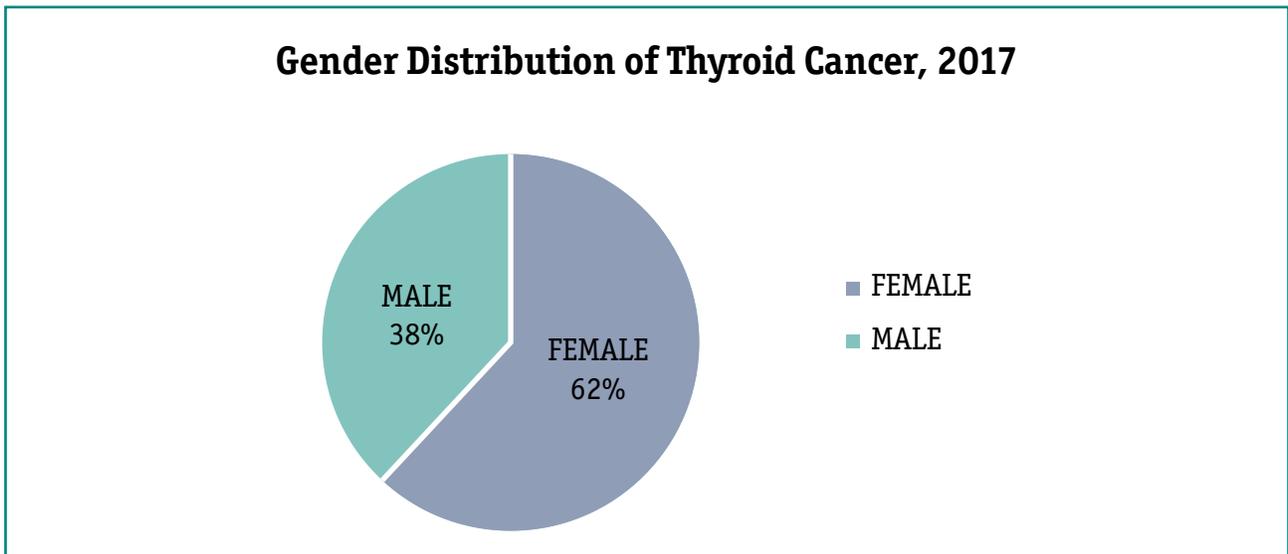
Prostate cancer was one of the top 10 cancer diagnosis among adults. It ranked 4<sup>th</sup> in cancer distribution among all adults, comprising 7% of all cases, and second among male adults comprising 16% of all cases.



## 5. Thyroid Cancer

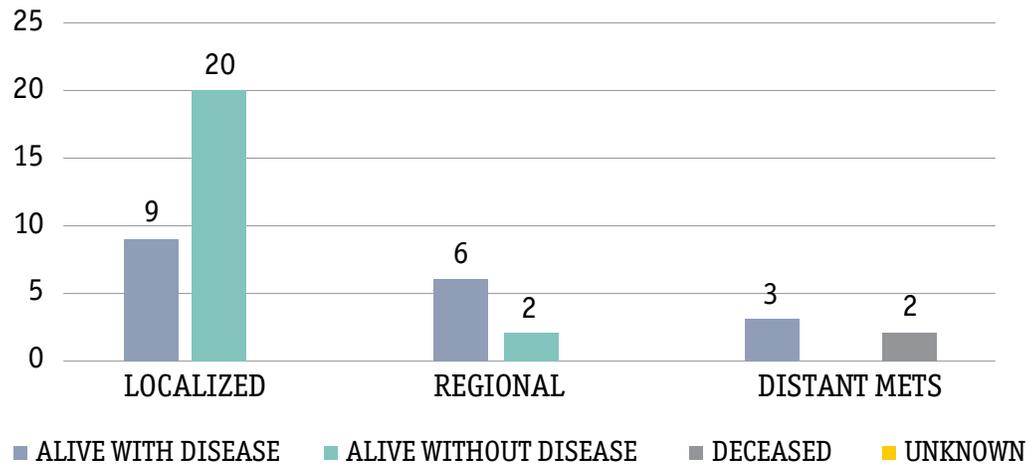
Thyroid cancer was the 3<sup>rd</sup> most common cancer in Saudi Arabia in 2013, and since it is predominately a female disease, it was the 2<sup>nd</sup> most common cancer in women across the Kingdom at 11%<sup>2</sup>. It was the 5<sup>th</sup> most common cancer at JHAH, representing 7.6% of all cancer cases. While it affects all age groups, the highest incident rate at JHAH was in the 40-49 and 50-59 age groups.

Most thyroid cancers presented as localized (69%) or regional (19%). The majority of cases were papillary type with a good prognosis. Thyroid cancer has a tendency to be multifocal and to spread to the lymph nodes. Survival is dependent on both stage and histology.

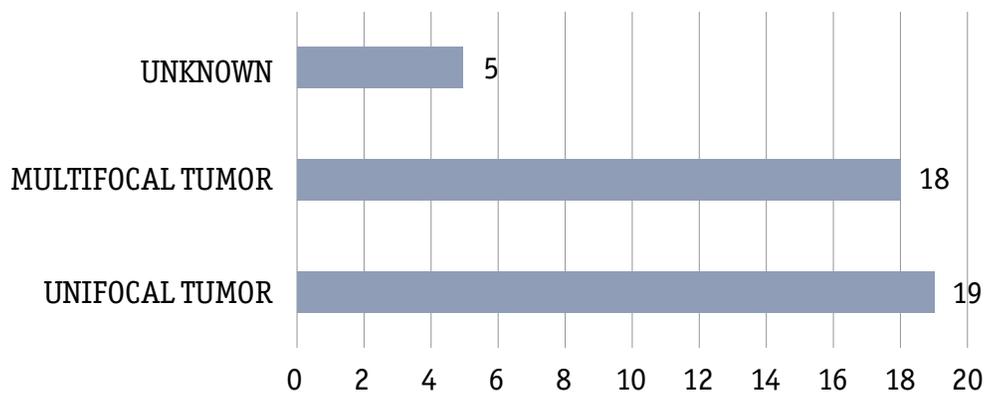


<sup>2</sup>Cancer Incidence Report Saudi Arabia 2014, Saudi Cancer Registry, Saudi Health Council, September 2017.

### Stage Distribution of Thyroid Cancer by Survival Status, 2017



### Focality Distribution of Thyroid Cancer, 2017



# Oncology Institute Spotlight 2017

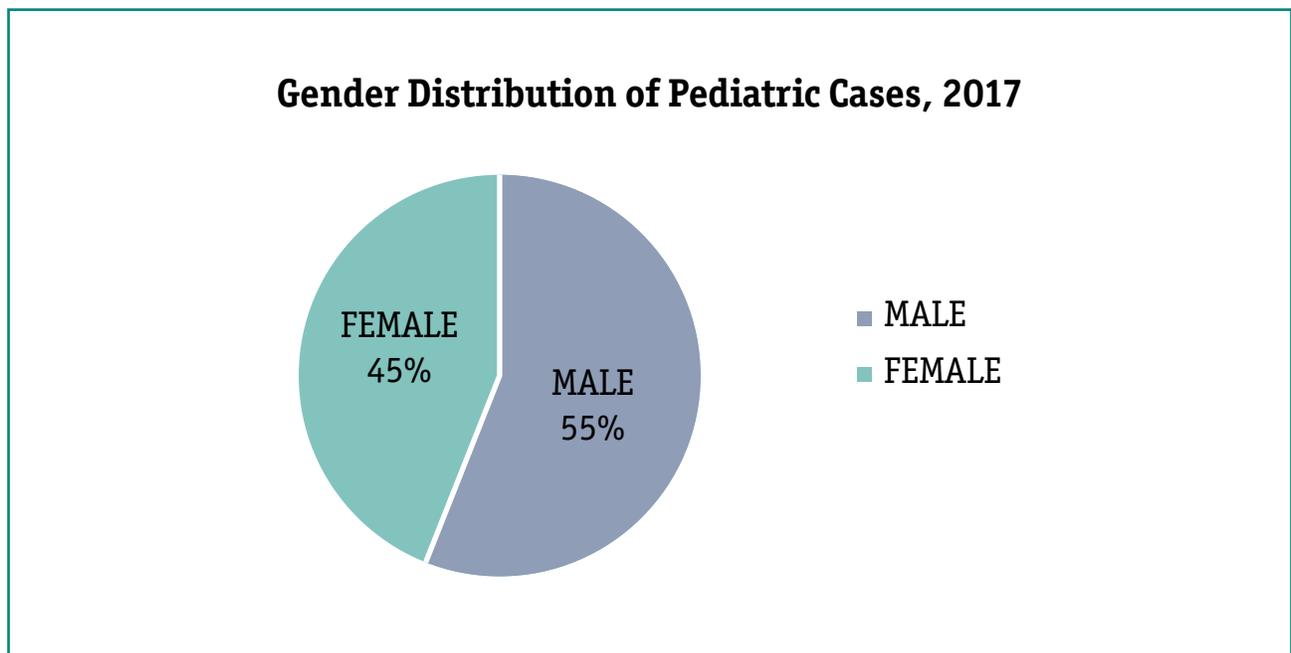
## Pediatrics

The overall survival rate for children’s cancer has significantly improved in the last 40 years. This is due to not only new treatments but also enhanced supportive care measures for these patients.

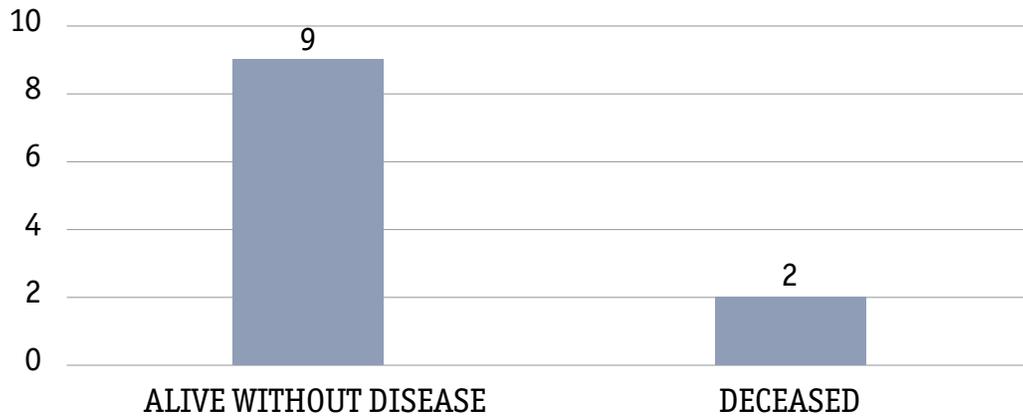
Many of the children who survive suffer devastating late effects including other cancers, heart disease and infertility. Childhood cancer in Saudi Arabia accounts for about 8% of total cancer cases. The most common encountered childhood cancers are leukemia, lymphoma and brain tumors.

At JHAH, our children with cancer not only have access to the most advanced treatment protocols but also excellent supportive care. New advancements in childhood cancer treatment including CAR T Cell Therapy and other immune-therapies will further enhance survival and bring hope of cure for children with poor prognosis.

In 2017, eleven (11) cases of childhood cancer were reported at JHAH. Of these, 55% were male and 45% female. The survival rate was around 82%. At 45% of the cases, leukemia was the most common childhood cancer at JHAH.



### Survival Distribution of Pediatric Cases, 2017



### Morphological Distribution of Pediatric Cases, 2017

Morphology	Total	%
B- Cell Acute Lymphoblastic Leukemia	3	27.2%
Acute Myeloid Leukemia	1	9.1%
Mixed Phenotype Acute Leukemia, B/Myeloid	1	9.1%
Embryonal Rhabdomyosarcoma	1	9.1%
Epithelioid Cell Melanoma	1	9.1%
Ewing Sarcoma	1	9.1%
Neuroblastoma	1	9.1%
Pilocytic Astrocytoma	1	9.1%
Pleomorphic Xanthoastrocytoma	1	9.1%
<b>Total</b>	<b>11</b>	

# *Conclusion*

The JHAH Oncology Institute places the patient and family at the center of care from the initial encounter through survivorship and palliative care.

Our staff use the Partners in Care Model to ensure quality and continuity of care. All institute staff, including physicians, OCN (oncology certified nursing) nurses and technicians, keep on top of their fields through training and education and use the latest equipment and technologies to provide the best quality of compassionate care.

