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Clinical Characteristic of Cardio-Oncology patients: First year Experience from United Arab of Emirates

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Abstract

Background: Cardio-oncology (CO) has emerged as a critical subspecialty with the increasing recognition of cancer therapy-related cardiovascular toxicity and improved cancer survival. Structured cardio-oncology services remain scarce in the Middle East, where patients often have a high burden of traditional cardiovascular risk factors. We aim to characterize the demographics, referral patterns, cardiovascular risk profile, and baseline cardiac assessments of patients referred to the first dedicated CO clinic in the United Arab Emirates (UAE).

Method: We conducted a retrospective analysis of all patients referred to the first CO clinic in UAE between January 1 and December 31, 2023. Data included demographics, clinical features, cardiovascular risk factors, primary oncology/hematology diagnoses, cardiovascular evaluations, biomarkers, and blood tests at baseline. The primary analysis focused on patient demographics, clinical characteristics, and baseline evaluations.

Results: Of 244 referred patients (mean age 56.3 ± 15.7 years, 55.3% female) in the first year, 40.2% were UAE nationals. Referrals were balanced between hematology (47.1%) and oncology (51.2%), with 55.0% of oncology patients having metastatic disease. Hypertension (50.4%), dyslipidemia (47.0%), diabetes mellitus (42.4%), and obesity (30.9%) were highly prevalent; pre-existing heart failure was present in 16.9%. LVEF was preserved (>50%) in 83.5%, mean GLS −17.6 ± 2.9%, and NT-proBNP >100 pg/mL in 53.4%. Potentially cardiotoxic therapies included anthracyclines (25.8%), chest radiotherapy (12.0%), HER2-targeted agents, BCR::ABL TKIs, and immune checkpoint inhibitors (11.2% each).

Conclusion: Patients referred to the UAE's first cardio-oncology clinic exhibit a high prevalence of cardiovascular risk factors despite a relatively low mean age. These findings emphasize the importance of timely referrals and robust collaboration between specialties to manage and monitor cardiotoxicity risks effectively.

Keywords: Cardio-Oncology; Cardiovascular Risk Factors; United Arab Emirates; Cancer Therapy-Related Cardiovascular Toxicity; Middle East.

Introduction

Cardio-oncology (CO) has emerged as a critical subspecialty over the past two decades due to the increasing recognition of cancer therapy-related cardiovascular toxicity (CTR-CVT) and the improving survival of

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cancer patients [1,2]. Contemporary oncology treatments, including anthracyclines, HER2-targeted agents, immune checkpoint inhibitors, and radiation therapy, carry significant cardiovascular risks ranging from heart failure and cardiomyopathy to arrhythmias, vascular events, and myocarditis [3,4]. Early identification and management of at-risk individuals through dedicated cardio-oncology services have been shown to reduce morbidity and allow uninterrupted cancer therapy [2-7]. Although cardio-oncology programs are now well established in Europe and North America, structured services remain scarce in the Middle East and Gulf Cooperation Council (GCC) countries [8,9]. Cultural, logistical, and resource-related factors, combined with a younger cancer population and high prevalence of traditional cardiovascular risk factors (diabetes, obesity, hypertension), create a unique regional challenge that has not been systematically described [10,11]. We therefore aimed to characterize the demographics, cardiovascular risk profile, baseline cardiac function, and oncology treatments of all patients referred to the first dedicated cardio-oncology clinic in the United Arab Emirates (UAE) during its inaugural year (2023) at Sheikh Shakhbout Medical City, Abu Dhabi (SSMC).

Methods

Study Design and Data Collection

This retrospective observational study was conducted at SSMC, a tertiary referral center in Abu Dhabi, UAE. The study included all consecutive adult patients (aged ≥18 years) with a confirmed hematological or solid tumor who were referred to the newly established CO Clinic between 1 January 2023 and 31 December 2023. The clinic is run by one cardio-oncology specialist and two cardiologists with cardio-oncology interest. The study was approved by the SSMC Institutional Review Board (IRB) (reference SSMCI-IRB-2023-0145) with a waiver of informed consent due to the retrospective design. Data was extracted from the institutional electronic medical record system (Cerner) by dedicated cardio-oncology team members. Collected variables included patient demographics (age, sex, nationality, insurance type), referring specialty, reason for referral, cancer diagnosis, disease stage (metastatic vs non-metastatic for solid tumors), and exposure to potentially cardiotoxic anticancer therapies (anthracyclines, HER2-targeted agents, immune checkpoint inhibitors, BCR::ABL tyrosine kinase inhibitors, chest-directed radiotherapy, VEGF inhibitors, fluoropyrimidines, and others).

Definitions

Cardiovascular parameters comprised traditional risk factors (hypertension, dyslipidemia, diabetes mellitus (DM), obesity [BMI ≥30 kg/m²], smoking status), prior cardiovascular disease (heart failure, coronary artery disease, atrial fibrillation, valvular disease, cardiomyopathy, device therapy), family history of premature cardiovascular events, and baseline cardiovascular medications. All patients underwent standardized cardiac evaluation including 12-lead electrocardiography, high-sensitivity troponin T, NT-proBNP, transthoracic echocardiography with measurement of left ventricular ejection fraction (LVEF) by Simpson's biplane method and global longitudinal strain (GLS) (Philips CVIS software), and cardiac magnetic resonance imaging (CMR) when clinically indicated. Late gadolinium enhancement (LGE) on CMR was reported as present or absent. Hematology and oncology parameters include diagnosis, presence of metastasis in oncology patients, class of therapy and reason for referral.

Statistical Analysis

All analyses were performed R version 4.5.2. Categorical variables are expressed as frequencies and percentages. Continuous variables are presented as mean ± standard deviation (SD) when normally distributed or as median and interquartile range (IQR) when non-normally distributed.

Results

Between January 1 and December 31, 2023, 244 patients were referred to the newly established cardio-oncology clinic at SSMC. The mean age was 56.3 ± 15.7 years, 135 (55.3%) were female, and 116 (47.5%) were ≥60 years old. UAE nationals represented 40.2% of the cohort, and other Arab nationalities 38.9%. Referrals were nearly equally distributed between hematology (n = 115, 47.1%) and oncology (n = 120, 51.2%), with 9 patients referred from both services. Among oncology patients, 66/120 (55.0%) had metastatic disease at the time of referral (figure 1). The most frequent reasons for referral were pre-chemotherapy cardiovascular risk stratification (n = 82, 33.6%), suspected or confirmed cardiotoxicity (n = 70, 28.7%), and other indications (n = 92, 37.7%) (table 1). Traditional cardiovascular risk factors were highly prevalent (table 2). Hypertension was documented in 119 patients (50.4%), dyslipidemia in 111 (47.0%), and DM in 100 (42.4%). Obesity (BMI ≥30 kg/m²) was present in 73 patients (30.9%), pre-existing heart failure in 40 (16.9%), and thyroid disorders in 37 (15.6%). History of coronary artery disease (prior myocardial infarction or revascularization) was noted in 31 patients (13.1%), and atrial fibrillation in 21 (8.9%) (figure 2). Baseline cardiovascular medications are summarized in table 3. Beta-blockers and statins were the most prescribed agents at baseline (both n = 84, 35.6%), followed by calcium-channel blockers (n = 59, 25.0%), angiotensin receptor blockers (n = 52, 22.0%), and anticoagulants (n = 49, 20.8%). SGLT2 inhibitors were used in 32 patients (13.6%). Electrocardiographic evaluation revealed sinus rhythm in 227 patients (93.0%), with a mean heart rate of 75.7 ± 15.9 bpm. Transthoracic echocardiography was

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performed in 188 patients; left ventricular ejection fraction (LVEF) by Simpson's biplane method was >55% in 136 (72.3%), 50–55% in 21 (11.2%), and <50% in 31 (16.5%). Mean GLS was −17.6 ± 2.9%. CMR was performed in 40 patients (16.4%). Mean LVEF on CMR was 54.3 ± 12.0%, with 23 patients (57.5%) showing LVEF >55%. LGE was absent in 31/38 evaluable cases (81.6%). Biomarker analysis showed elevated NT-proBNP (>100 pg/mL) in 130 patients (53.4%) and >300 pg/mL in 73 (30.2%). High-sensitivity troponin T was detectable in all tested patients (mean 0.18 ± 0.21 ng/L). Mean hemoglobin was 120.3 ± 20.3 g/L and mean serum creatinine 88.6 ± 91.0 µmol/L. Exposure to potentially cardiotoxic anticancer therapies is presented in table 4. Anthracyclines were the most frequently used class (n = 60, 25.8%), followed by chest-directed radiotherapy (n = 28, 12.0%), HER2-targeted agents (n = 26, 11.2%), second- or third-generation BCR:ABL tyrosine kinase inhibitors (n = 26, 11.2%), and immune checkpoint inhibitors (n = 26, 11.2%).

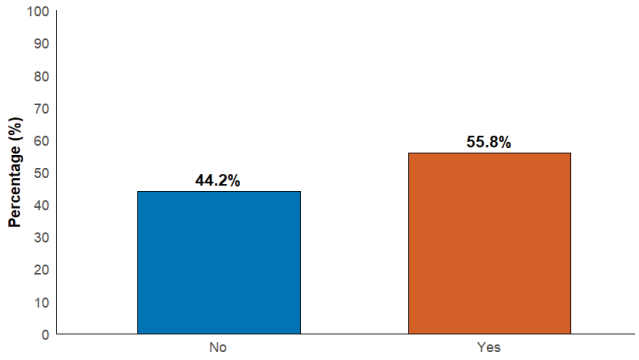

Figure 1: Percentage of Metastatic Cases Among Oncology Patients.

Proportion of oncology patients with metastatic disease at the time of referral to the cardio-oncology clinic of the 120 patients referred from oncology services, 66 (55.0%) had confirmed metastatic disease whereas 54 (45.0%) had non-metastatic/locally advanced disease.

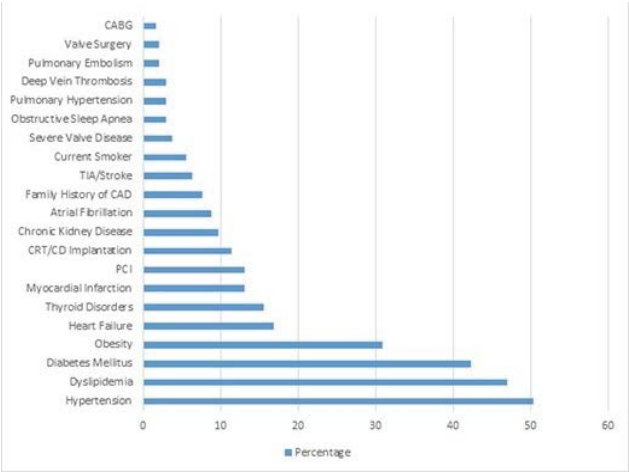

Figure 2: Prevalence of Comorbidities.

Prevalent comorbidities included hypertension (50.42%), dyslipidemia (47.03%), and diabetes mellitus (42.37%). Other conditions included obesity (30.93%), heart failure (16.88%), and thyroid disorders (15.61%).

Table 1: Demographics and Referral Characteristics.

Variable	Level	Count (n)	Percentage (%)
Sex	Female	135	55.33
	Male	109	44.67
Insurance	Thiqa	105	43.03
	Daman	91	37.3
	Mandate	40	16.39
	Others	8	3.28
Nationality	UAE	98	40.16
	Arab	95	38.93
	Other	51	20.9
Referring Service	Hematology	115	48.94
	Oncology	120	51.28
Reason for Referral	Pre-Chemotherapy Assessment	82	33.61
Complications		70	28.69
Others		92	37.7

Table 2: Prevalence of Comorbidities in the Study Population.

Variable	n	%
Hypertension	119	50.42
Dyslipidemia	111	47.03
Diabetes Mellitus	100	42.37
Obesity	73	30.93
Heart Failure	40	16.88
Thyroid Disorders	37	15.61
Myocardial Infarction	31	13.08
PCI	31	13.08
CRT/CD Implantation	27	11.39
Chronic Kidney Disease	23	9.75
Atrial Fibrillation	21	8.86
Family History of CAD	18	7.63
Cardiomyopathy	17	7.17
TIA/Stroke	15	6.38
Current Smoker	13	5.51
Severe Valve Disease	9	3.8
Angina	8	3.38
Obstructive Sleep Apnea	7	2.97
Pulmonary Hypertension	7	2.97
Deep Vein Thrombosis	7	2.97
Pulmonary Embolism	5	2.12

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Valve Surgery	5	2.11
CABG	4	1.69
Family History of DCM	4	1.69
Other Arrhythmias	6	2.53
Peripheral Vascular Disease	2	0.85
Family History of SCD	2	0.85
TKI Arteritis	1	0.43
ABI Abnormal	0	0

Abbreviations: PCI, percutaneous coronary intervention; CRT, cardiac resynchronization therapy; CD, cardioverter-defibrillator; CAD, coronary artery disease; TIA, transient ischaemic attack; DCM, dilated cardiomyopathy; SCD, sudden cardiac death; CABG, coronary artery bypass grafting; ABI, ankle-brachial index; CKD, chronic kidney disease; AF, atrial fibrillation; OSA, obstructive sleep apnoea; PH, pulmonary hypertension; DVT, deep vein thrombosis; PE, pulmonary embolism; TKI, tyrosine kinase inhibitor.

Table 3: Baseline prescribed Cardiovascular Medications in Study Population.

Medication	n	%
Beta Blockers	84	35.59
Statins	84	35.59
Calcium Channel Blockers	59	25
Angiotensin Receptor Blockers	52	22.03
Anticoagulants	49	20.76
SGLT Inhibitors	32	13.56
Diuretics	30	12.71
ACE Inhibitors	28	11.86
Ivabradine	9	3.81
Aldosterone Antagonists	8	3.39
Nitrates	7	2.97
Thiazides	7	2.97
ARNI	6	2.54
Antiarrhythmics	4	1.69
Fenofibrate	1	0.42

Abbreviations: ACE, angiotensin-converting enzyme; ARNI, angiotensin receptor–neprilysin inhibitor; SGLT, sodium-glucose cotransporter (inhibitor).

Table 4: Distribution of Treatment Classes in Study Population.

Class Name	n (Yes)	% (Yes)
Others	172	74.14
Anthracyclines	60	25.75
RT to a volume including the heart	28	12.02
HER2-Targeted Therapies	26	11.16
Second and Third Generation BCR-ABL TKI	26	11.16
ICI	26	11.16
VEGFi	22	9.44
Fluoropyrimidines	21	9.01
PI	14	6.01
BTK Inhibitors	6	2.58
Osimertinib	4	1.72
RAF and MEK inhibitors	1	0.43
HSCT	1	0.43
CAR-T and TIL	0	0

Abbreviations: RT, radiotherapy; HER2, human epidermal growth factor receptor 2; BCR-ABL TKI, BCR-ABL tyrosine kinase inhibitor; ICI, immune checkpoint inhibitor; VEGFi, vascular endothelial growth factor inhibitor; PI, proteasome inhibitor; BTK, Bruton's tyrosine kinase; HSCT, haematopoietic stem cell transplantation; CAR-T, chimeric antigen receptor T-cell therapy; TIL, tumour-infiltrating lymphocyte therapy.

Discussion

In the inaugural year of the UAE's first dedicated cardio-oncology clinic, we identified a strikingly high burden of cardiovascular comorbidities among patients referred for baseline risk stratification or suspected cancer therapy–related cardiovascular toxicity (CTR-CVT). Despite a relatively young mean age of 56 years, nearly a decade younger than most western cardio-oncology cohorts, rates of hypertension (50%), dyslipidemia (47%), DM (42%), and obesity (31%) were markedly elevated. The prevalence of DM alone is among the highest documented in cardio-oncology literature and aligns with the broader epidemiologic profile of the Gulf region, where metabolic syndrome and early-onset cardiometabolic disease are highly prevalent [12-14]. Furthermore, 17% of our cohort presented with established heart failure at the time of referral, and over half demonstrated elevated NT-proBNP, highlighting the substantial burden of overt and subclinical cardiac dysfunction. The demographic profile of our cohort reflects the unique regional context. Females comprised 55% of referrals, lower than many western breast-cancer-heavy cohorts, with a higher proportion of hematological and gastrointestinal malignancies in our population [15,16]. Only 40% were UAE nationals, with the remainder predominantly expatriate Arabs and South Asians, underscoring the multicultural composition of the Gulf cancer population and potential implications for genetic and lifestyle risk profiles [17,18]. Notably, the 17% prevalence of pre-existing heart failure is among the highest reported globally, likely reflecting both delayed diagnosis and the severe baseline cardiometabolic burden. Exposure to HER2-targeted therapies and immune checkpoint inhibitors was relatively modest (11% each), possibly reflecting referral bias toward established cardiotoxicity rather than primary prevention. Several factors are likely to contribute to this high-risk profile. Cardiovascular risk factors are highly prevalent in the UAE and are often present at younger ages

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[19,20]. By contrast, European cardio-oncology programs report much lower baseline diabetes prevalence; for instance, the CARDIOTOX registry reported diabetes in only 13% of patients [21]. Additionally, more than half of solid tumor patients were metastatic at the time of referral, indicating that cardio-oncology consultation commonly occurs late in the treatment pathway. Limited awareness of cardio-oncology services and evolving collaboration between oncology and cardiology may further delay recognition of CTR-CVT. Such delays reduce opportunities for early risk modification and have been associated with treatment interruptions, dose reductions, or premature discontinuation in published cardio-oncology registries [22,23]. A key strength of our clinic is the systematic integration of advanced cardiac diagnostics. Strain imaging was routinely employed, providing sensitive detection of early myocardial dysfunction. CMR performed in 16% of patients, added valuable diagnostic clarity, particularly in suspected myocarditis, infiltrative processes, or equivocal echocardiographic findings. These capabilities are not yet widely available in the region and underscore the clinical benefit of embedding multimodality imaging in cardio-oncology pathways. Cardio-oncology literature from the Middle East remains limited. The only other reported Middle Eastern experience, from Lebanon (n=119), described lower rates of DM (19%) and no reported pre-existing heart failure, highlighting that our UAE cohort exhibits one of the highest cardiometabolic burdens documented regionally or internationally [24-26]. Our study therefore provides one of the first comprehensive characterizations of a Gulf-region cardio-oncology population and highlights the need for region-specific risk prediction tools. While Western guidelines provide excellent frameworks, their applicability to younger, metabolically high-risk Middle Eastern populations requires prospective validation. These findings underscore the urgent need for national and regional strategies to improve early cardiovascular risk stratification among patients receiving potentially cardiotoxic therapy. Recommended measures include standardized pre-treatment referral pathways, expansion of survivorship programs for long-term cardiac monitoring, and enhanced multidisciplinary collaboration through CME programs, combined tumor boards, and automated referral triggers. Given the exceptionally high prevalence of cardiovascular risk factors, aggressive primary prevention is essential. Key strategies include early initiation of statins, ACEI/ARBs, beta-blockers, and SGLT2 inhibitors in appropriate high-risk patients; structured lifestyle interventions targeting weight, diet, and physical activity; and risk-adapted surveillance using GLS, troponin, and NT-proBNP. Such approaches may reduce CTR-CVT, prevent treatment interruptions, and improve overall oncologic outcomes [2-27]. Limitations include the retrospective, single-center nature of the study, which is subject to selection bias and incomplete documentation. Although SSMC serves as one of the largest tertiary referral centers in the UAE, our cohort may over-represent high-risk or complex cases and may not fully reflect cardio-oncology practice in community settings or across the broader Gulf region with its diverse expatriate population.

Conclusion

Patients referred to the first dedicated cardio-oncology clinic in the UAE were relatively young yet exhibited an exceptionally high prevalence of CV risk factors and pre-existing HF. More than half of oncology patients already had metastatic disease, and one-third of referrals were for established cardiotoxicity. These findings reveal delayed integration of cardio-oncology services in the region despite a high baseline cardiometabolic burden. Earlier systematic CV risk stratification, aggressive primary prevention, and seamless multidisciplinary pathways are urgently required to reduce CTR-CVT and optimize cancer outcomes in this high-risk Middle Eastern population.

Conflicts of Interest

The authors declare that they have no conflicts of interest relevant to this manuscript.

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