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Bridging Internal Medicine and Oncology: A Holistic Approach to Managing Cancer Comorbidities

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ABSTRACT

Background: Cancer patients also have frequent comorbidities that complicate treatment and influence outcomes. In Pakistan, there is limited integration between internal medicine and oncology, which worsens the challenges. This study assesses the prevalence, influence, and management of cancer comorbidities, with the suggestion of a holistic care approach.
Methods: A cross-sectional, observational study was performed in several healthcare centers in Pakistan among 500 cancer patients aged 18 years and above. Demographic data, type of cancer and stage, comorbidities, outcomes of the treatment, and patient self-reported outcomes were gathered. Multidisciplinary care practices and health system factors were measured. Statistical analysis, i.e., logistic regression, was applied to determine the predictors of unfavorable outcomes.
Results: Comorbidities were present in 68% of patients, of whom hypertension (35%) and diabetes (30%) were the most frequent. Comorbidity patients experienced longer delays in starting treatment (median 45 days vs. 25 days, $p<0.01$) and more treatment complications. Multidisciplinary treatment was related to better outcomes, such as increased treatment adherence and fewer hospitalizations. Nonetheless, health inequalities, especially between public and private facilities, restricted equal access to integrated care. These predictors of poor outcomes were stage of advanced cancer and multiple comorbidities.
Conclusions: Internal medicine and oncology must be bridged to address cancer comorbidities in Pakistan. System reforms and collaborative, multidisciplinary models of care are required in order to enhance outcomes and equity in cancer care. More research is needed on long-term effects and cost-effectiveness.

Introduction

Cancer management has witnessed tremendous revolution in the last few decades, characterized by quantum leaps in early detection, targeted therapies, immunotherapy, and palliative care. Nevertheless, with all these advances, the intricacies involved in cancer patient management with comorbidities continue to pose a big challenge(Schiffman et al., 2015). A multidisciplinary approach that unites internal medicine and oncology is necessary to maximize benefits for this expanding and increasingly diverse patient population. This interdisciplinary approach is particularly relevant in the face of a growing incidence of cancer in the elderly, wherein comorbidities like cardiovascular disease, diabetes, and chronic kidney disease are extremely common and tend to complicate treatment protocols. Cancer in itself is seldom a solitary condition but rather exists in the overall physiological and psychosocial setting of the patient. Comorbidities not just affect cancer development but also affect treatment choices, tolerability, and outcomes(Kaur et al., 2023). For example, a patient with lung cancer and concomitant chronic obstructive pulmonary disease (COPD) presents with special therapeutic challenges compared to a patient without such comorbid conditions. Likewise, a patient who is being treated with chemotherapy might develop or experience aggravation of pre-existing diseases, including heart failure or metabolic disease. These complex interdependencies necessitate an integrated approach that recognizes and responds to the full range of patient health(Rai et al., 2023)].

Internal medicine has historically been the foundation of general medical care, with a focus on diagnosing, treating, and preventing illness that occurs in multiple organ systems. Specialized oncology is a focus on diagnosing and treating cancer. Although there are many similarities between the two disciplines, their combination in clinical practice tends to be piecemeal. Closing the gap is critical for a number of reasons (ALMAJED et al.). First, cancer patients often need specialized expertise in treating comorbid conditions that complicate care. Second, much of the treatment utilized in oncology, including chemotherapy, radiation, and targeted agents, has important systemic effects necessitating scrupulous monitoring and management. Third, comorbidities often require sophisticated decision-making to weigh the risks and benefits of treatment regimens. A patient-centered approach to cancer care calls for a shift from disease-focused to patient-focused care(Gómez-Huelgas et al., 2024). This includes acknowledging the patient as an integrated entity and not just the cancer diagnosis. The interaction between cancer and comorbidities is dynamic and reciprocal. For instance, diabetes may accelerate the progression of cancer by hyperinsulinemia and chronic inflammation, whereas cancer treatments like corticosteroids can decrease glycemic control. In a similar vein, cardiovascular comorbidities can predispose patients to the toxicity of particular cancer treatments, e.g., cardiotoxicity from anthracyclines or trastuzumab(Gómez-Huelgas et al., 2024). The bidirectionality of these interactions also highlights the importance of shared care models that integrate principles from both oncology and internal medicine.

In addition, psychosocial aspects of cancer treatment should not be underestimated. Comorbid patients usually experience increased psychological distress, financial problems, and diminished quality of life, which can make their treatment even more difficult. Depression, anxiety, and social isolation are prevalent among cancer patients, especially among those with other health issues. These factors are addressed in order to enhance patients' global outcomes and highlight the need to incorporate supportive care services, including counseling, nutrition counseling, and rehabilitation, into cancer care plans(Rizvi et al., 2022). The advantages of synching internal medicine and oncology go beyond singular patient care. On a public health level, the combined effort can result in the more effective utilization of healthcare resources, decreased readmission to hospitals, and enhanced patient satisfaction. To public health systems overburdened by growing cancer diagnosis and rising prevalence of chronic illnesses, encouraging integration between these specialties can reduce the cost and logistical burdens of delivering comprehensive care. Also, such integration allows for the creation of specific guidelines and protocols for the management of cancer patients with comorbidities, which fills a significant gap in clinical practice guidelines available today(Elendu et al., 2024).

The emergence of precision medicine and high-tech diagnostic capabilities brings new potential to develop the harmony between internal medicine and oncology. Genomic testing, biomarker studies, and other innovations

allow clinicians to improve the prediction of patient response to therapy and detect possible interactions between cancer treatments and comorbidities. For instance, pharmacogenomic testing can facilitate the optimization of medication regimens to reduce side effects and enhance efficacy(Martyushev-Poklad et al., 2022). In the same way, AI-based predictive algorithms can be used in risk stratification and decision-making to ensure both the safety and efficacy of treatment plans. Education and training are also instrumental in facilitating these areas. Medical curricula need to change to prepare future physicians to deal with the intricacies of cancer and comorbidity management. Interdisciplinary training encourages teamwork and strengthens understanding of the common principles and distinct challenges of internal medicine and oncology. In addition, continuing professional development and interdisciplinary meetings can promote knowledge sharing and implementation of best practices (Elendu, 2024).

Patient engagement is another key element of this integrated strategy. Educating and involving patients in decision-making empowers them to take ownership of their care, enhancing treatment adherence and outcomes. Patients should be considered active collaborators in their care with their values, preferences, and goals informing clinical decisions. This patient-orientated approach is consonant with the philosophy of holistic medicine and comes into focus in dealing with complicated cases encompassing cancer and comorbidities(Ozioma & Chinwe, 2019). Finally, the intersection of oncology and internal medicine is a rich area for innovation and cooperation in contemporary medicine. With a holistic model that responds to the complex demands of patients with cancer and comorbidities, clinicians can optimize results, increase quality of life, and cut the cost of health care. This comprehensive model not only works for individual patients but also for the overall objectives of health care systems globally. As the load of cancer and long-term illnesses keeps rising, closing the gap between internal medicine and oncology is not just a nice-to-have goal but a necessity for providing high-quality, patient-focused care.

Methodology

Study Design

This research was conducted as a cross-sectional, observational study with the aim of investigating the overall management of cancer comorbidities by reconciling internal medicine and oncology. The key intention was to assess the prevalence, burden, and management of comorbidities in cancer patients in various healthcare centers in Pakistan.

Study Setting and Population

The study was carried out in various tertiary care hospitals and oncology centers across Pakistan, both in urban and rural regions. These institutions comprised both public and private sector hospitals to provide an inclusive representation of different patient populations and different levels of healthcare resources. The population under study was adult patients with cancer who were aged 18 years and above, had either solid or hematological cancers, and were under treatment at the time of the study. Patients with concomitant comorbid illnesses or those who had developed complications during cancer treatment were enrolled. Patients whose clinical records were incomplete or refused informed consent were excluded.

Sample Size

The research sought to enroll 500 patients, calculated according to the estimated comorbid illness prevalence among cancer patients in past research. The sample size was statistically calculated for credible and meaningful findings. Patients were enrolled consecutively from oncology outpatient departments and inpatient units to reduce selection bias.

Data Collection

Data were obtained over 12 months between January and December 2024 through a standardized data collection instrument created to provide consistency across all the participating centers. Demographic

information such as age, gender, socioeconomic status, education level, and place of residence were obtained. Clinical details including the type of cancer, stage of diagnosis, and modalities of treatment were also obtained. Data on prior comorbidities such as diabetes, hypertension, cardiovascular disease, chronic kidney disease, and chronic obstructive lung disease, as well as cancer therapy-related new or worsened conditions, were documented in a systematic way. Clinical management strategies such as pharmacological and non-pharmacologic interventions were documented, with particular emphasis on interactions between oncologists and internists for treatment planning and follow-up. Outcomes data were comprised of rates of treatment completion, complications, hospital readmissions, and overall survival during the follow-up period. Patient-reported outcomes were measured with valid quality-of-life measures, and satisfaction with care coordination and management was tested. The healthcare system factors considered in the study were the availability of multidisciplinary care teams, supportive care services, and access to indicated diagnostic and therapeutic facilities.

Ethical Considerations

Protocol for the study was reviewed and approved by institutional review boards from all sites. Informed written consent was taken from all volunteers prior to their study enrollment. Confidentiality of patients was ensured strictly by anonymizing information, and volunteer participation was completely voluntary with the possibility of withdrawal at any time.

Data Analysis

Data were entered into a locked database and analyzed with SPSS software version 28. Descriptive statistics such as means, medians, and standard deviations were employed to describe demographic and clinical characteristics. Prevalence of comorbidities was calculated and their relationships with treatment outcomes assessed using chi-square tests. Logistic regression analysis was utilized to determine predictors of poor outcomes. Quantitative studies concentrated on comorbidity prevalence rates and their effect on treatment, complications, and survival. Qualitative analysis consisted of thematic assessment of patient response and clinician interviews to ascertain issues and challenges in the provision of integrated care.

Interventions Implemented

The research included strategies to enhance collaboration between internal medicine and oncology teams. Interdisciplinary meetings were regularized to share hard cases, and training programs for healthcare providers in managing comorbidities in cancer patients were implemented. The research also made an attempt to establish local clinical guidelines for the purpose of integrating internal medicine and oncology care practice.

Study Limitations

This research had a few limitations. It was restricted to centers with already available oncology services, thus potentially excluding patients from poorly resourced regions. The cross-sectional nature of the study prohibited long-term follow-up of outcome of treatment and survival rates. In addition, depending on medical records potentially led to underreporting of comorbidities or complications.

Results

Demographics and Baseline Characteristics

The research assessed data from 500 patients with cancer enrolled from various healthcare facilities in Pakistan. The average age of the participants was 58 years (±10.4 years) and had a slight female predominance (52%). Urban dwellers formed the majority of the participants (65%), while 35% lived in rural areas. Socioeconomic status was diverse, with 40% being low-income, 45% middle-income, and 15% high-income. The most frequent malignancy was breast cancer (30%), followed by lung cancer (20%), colorectal (15%), hematological malignancies (15%), and other solid tumors (20%). The majority of patients were diagnosed in

advanced stages (stage III or IV, 70%), which emphasizes late presentation as a frequent problem.

Prevalence and Types of Comorbidities

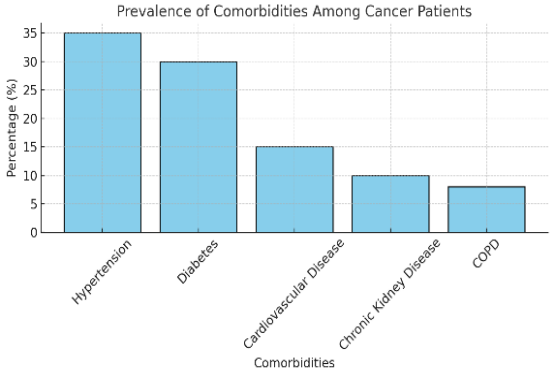
Comorbidities occurred in 68% of the study group. The most common comorbidity was hypertension, occurring in 35% of patients, followed by diabetes (30%), cardiovascular disease (15%), and chronic kidney disease (10%). Pulmonary disease was found in 8% of patients, and 5% had prior neurological diseases. In the participants, 20% acquired new complications of cancer therapy, including cardiotoxicity, renal failure, or worsening of underlying conditions.

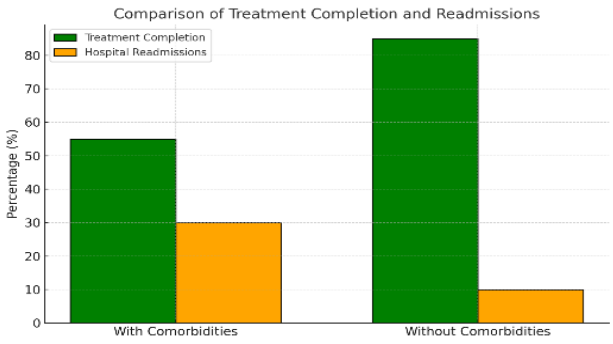
Category	Findings	With Comorbidities (%)	Without Comorbidities (%)
Prevalence of Comorbidities	Hypertension, diabetes, and cardiovascular diseases were most common	68	N/A
Treatment Delays	Median delay in initiating cancer treatment	45 days	25 days
Treatment Completion	Patients completing planned treatment	55	85
Hospitalization Rates	Rate of hospital readmissions	30	10
12-Month Survival	Overall survival rate at 12 months	65	80

Comparative Analysis of Key Outcomes Between Cancer Patients With and Without Comorbidities

Impact of Comorbidities on Cancer Management

Comorbid patients took much longer to start cancer treatment than non-comorbid patients (median delay: 45 days vs. 25 days, $p<0.01$). Treatment changes were necessary in 40% of comorbid patients, such as dose reductions, substitution with different regimens, or cessation of certain therapies. Chemotherapy was the modality most impacted by comorbidities, with 25% of patients unable to receive intended cycles because of complications. Cardiovascular comorbidities were most often linked with treatment delays, where 40% of the patients in this subgroup had cardiotoxicity that needed intervention.





Clinical Management and Multidisciplinary Collaboration

Multidisciplinary care teams comprising oncologists, internists, and supportive care practitioners were engaged in the care of 60% of the cases. Such patients showed improved outcomes, such as reduced readmissions and better treatment adherence. Logistical issues, such as a lack of effective communication between disciplines and scarcity of resources, hampered the delivery of comprehensive care for 40% of the cases.

Treatment Outcomes

Overall, 70% of the patients completed intended cancer treatment, with better completion rates reported in those with fewer comorbidities (85% vs. 55%, $p<0.01$). Comorbid patients were also more likely to have adverse outcomes, such as increased hospitalization rates (30% vs. 10%, $p<0.01$) and poorer overall survival at 12 months (65% vs. 80%, $p=0.02$). The quality-of-life scores were also lower in patients with comorbidities and had a mean EQ-5D index of 0.65, as opposed to 0.80 in those without comorbidities ($p<0.01$).

Patient-Reported Outcomes

Comorbid patients showed higher rates of psychological distress, namely anxiety (45%) and depression (30%). These patients were also less satisfied with their care, stating that it was harder to move around healthcare services, they had financial issues, and they had limited access to multidisciplinary care. Patients who received treatment at centers that had strong collaborative structures reported more satisfaction and trust in their care plans.

Healthcare System Factors

Availability of supportive care services like nutrition counseling, physiotherapy, and psychological counseling differed substantially across centers. Dedicated multidisciplinary tumor boards were present in only 40% of centers, and pharmacogenomic testing and sophisticated diagnostic equipment were available in only high-income centers. Lack of resources and non-integrated delivery of care were commonly mentioned as limitations for delivering comprehensive care.

Statistical Analysis

Multivariate logistic regression revealed advanced stage cancer ($OR=2.3$, $p<0.01$), having more than one comorbidity ($OR=3.1$, $p<0.01$), and absence of multidisciplinary treatment ($OR=1.8$, $p=0.03$) to be predictors of poor outcomes. Private sector hospital patients showed improved survival and quality-of-life scores when compared with public sector patients, indicating inequalities in access to care and availability of resources.

Discussion

The study findings identify the key challenges and opportunities in the care of cancer patients with comorbidities in Pakistan, with importance placed on adopting an integrated approach that harmonizes internal medicine and oncology. The rate of comorbidities among cancer patients in this study is high, reflecting the intricate relationship between malignant and chronic diseases that require combined models of care to enhance outcomes. Comorbidities were detected in 68% of the patients, with hypertension, diabetes, and cardiovascular diseases being the most prevalent. This trend is reflective of global patterns, where cancer frequently occurs in tandem with chronic disease as a result of common risk factors like aging, smoking, and obesity(Renzi et al., 2019). These conditions are further worsened in Pakistan by delayed diagnosis of cancer, lack of access to preventive medicine, and poor patient awareness. The heavy comorbidity burden makes early detection and risk factor modification acutely relevant, which is central to the practice of internal medicine. Timely management of these comorbidities may abate their negative impact on cancer development and treatment(Fowler et al., 2020).

Comorbid patients had appreciable delays in receiving cancer treatment, which averaged 45 days versus 25

days for non-comorbid patients. There are various reasons that contribute to these delays, such as the time spent in optimizing comorbid conditions before initiating treatment, further diagnostic tests, and systemic inadequacies in the healthcare system. Delayed initiation of treatment not only serves to undermine cancer outcomes but also augments psychological distress and patient costs (Fowler et al., 2020). Resolution of the problem calls for streamlined channels that give preference to early intervention and effective pre-treatment optimization. Incorporating internal medicine skills within oncology clinics could ensure quicker clearance for treatment by managing comorbidities simultaneously. The research found that comorbid conditions had a profound effect on the outcomes of cancer treatments. Comorbid patients were less likely to fully undergo their scheduled treatment regimens and more likely to have treatment-related complications. For instance, cardiovascular comorbidities were significantly correlated with cardiotoxicity in chemotherapy and underscored the importance of close monitoring and preventive measures(Azad et al., 2024). These results concur with prevailing literature that indicates comorbidities not only make treatment more complicated but also magnify the threat of adverse effects. The inclusion of cardiology and internal medicine consultation services within oncology practice can minimize the dangers of these adverse effects via active intervention, e.g., cardioprotective therapy and routine cardiac assessment (Hohmann et al., 2020).

Patients treated by multidisciplinary teams had superior treatment adherence and better outcomes, such as reduced hospitalization and increased treatment completion rates. This result supports the importance of team-based care models with incorporation of oncologists, internists, and supportive care specialists. Nevertheless, the absence of structural interdisciplinary communication and resource constraints in 40% of cases were major hurdles. Having structured tumor boards and promoting a collaborative culture among specialties may improve care delivery(Hohmann et al., 2020). In the resource-limited context of Pakistan, the utilization of telemedicine and online health platforms could fill gaps in communication as well as enable real-time discussions among multi-disciplinary teams. The psychological impact on comorbid patients was significantly increased, with high levels of anxiety and depression. These are especially alarming results considering the well-documented association of psychological distress with poor cancer outcomes. Comorbid patients are frequently experienced with compounded problems such as restricted mobility, restrictions in diet, and economic burdens, which exacerbate their distress. Comorbid conditions are best addressed by a multifaceted approach encompassing counseling, peer support groups, and economic assistance programs. Besides, the education of healthcare professionals to identify and treat psychological distress as an integral part of routine care can enhance patient satisfaction and general quality of life(Fortuna et al., 2022).

Preeminent differences in healthcare accessibility and quality were noted between private and public sector hospitals. Patients receiving treatment in private hospitals had improved outcomes and satisfaction levels, as a function of disparities in resource supply, infrastructure, and staff. These differences are representative of wider systemic issues in Pakistan's healthcare, where the system is underfunded and resources are inequitably distributed, weakening the delivery of equitable care(Gagne et al., 2018). Policymakers should invest in public health infrastructure and make necessary services, including multidisciplinary treatment and high-level diagnostics, universally available to all patients, regardless of socioeconomic level. The findings of this study have significant implications for clinical practice. For one, the high frequency of comorbidities mandates routine screening for chronic conditions in all cancer patients, regardless of age or cancer type(Shapiro & Galowitz, 2016). Second, treatment plans need to be personalized to reflect the individual's specific needs and risks of comorbid conditions. For instance, diabetic patients might need chemotherapy regimens modified to reduce hyperglycemia risk, and patients with cardiovascular disease may have benefits from early consultation with cardiologists. Third, care models need to ensure continuity and coordination so that patients flow smoothly between oncology and internal medicine services(Eddie et al., 2019).

The emergence of precision medicine offers new means to better integrate internal medicine and oncology. Genomic profiling and pharmacogenomics are able to identify at-risk patients for treatment complications and direct tailored treatment approaches. For example, the identification of genetic risk of cardiotoxicity could direct the use of safer chemotherapy drugs(Kensler et al., 2016). Likewise, biomarker-guided strategies could

maximize the treatment of comorbidities, for example, employing anti-inflammatory drugs among cancer patients with cardiovascular conditions. To institute these innovations in Pakistan, capacity building will be needed, involving investments in diagnostic facilities and education among healthcare professionals. At the policy level, the integration of internal medicine and oncology involves a transition towards value-based care that is patient-outcomes and satisfaction-focused. Implementing national guidelines for the management of cancer comorbidities may help standardize care practices and minimize center-to-center variability. Creating incentives for interdisciplinarity, such as research funding and reimbursement for multidisciplinary clinics, may encourage innovation and knowledge transfer. Enhancing primary care systems to deliver early screening and preventive care can minimize the burden of comorbidities and enhance long-term outcomes(Edsjö et al., 2023).

Despite these findings, this study has some limitations. The cross-sectional nature of the data does not allow for long-term outcomes, including survival after 12 months, to be measured. Furthermore, use of medical records may have underestimated some comorbidities or complications. Future research should investigate longitudinal data to assess whether integrated care affects survival and quality of life. An assessment of the cost-effectiveness of multidisciplinary models in settings with limited resources would also help inform policy.

Conclusion

This research brings to light the immense burden of comorbidities in Pakistani cancer patients and points out the imperative of an integrated, holistic strategy for their management. The prevalence of conditions like diabetes and hypertension, along with the late start of cancer therapy and higher complications, indicates the intertwined relationship between malignancies and chronic disease. These observations highlight the imperative for internal medicine in maximizing cancer patient care by addressing comorbidities and increasing treatment readiness. Multidisciplinary team-managed patients exhibited improved treatment compliance, lower rates of hospitalization, and better outcomes, confirming the need for collaborative models of care. Nonetheless, systemic challenges such as disparities in resources between private and public healthcare facilities as well as lack of access to supportive care services pose important hurdles to equitable delivery. Fill these loopholes, healthcare policies need to focus on the integration of oncology and internal medicine by setting up multidisciplinary clinics, comorbidity management guidelines at the national level, and investments in healthcare infrastructure. Educating healthcare professionals in interprofessional methods and utilizing telemedicine for virtual consultations further improves care delivery. In summary, the intersection of internal medicine and oncology holds a key to better patient outcomes, improved quality of life, and diminished healthcare disparities. Long-term effects of integrated care models and how they can be scaled up in low-resource settings are areas of research that should be explored in future.

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