

Research Article

Cancer-Related Out-of-Pocket Expenses Among Patients Receiving Chemotherapy at Benghazi Medical Center, Libya: A Cross-Sectional StudyAsma Al-Tarqi ^{1, }, Malak Ahmed Al-Zawi ^{2, }, Khalid Rajab Mukhtar ^{3, *, }¹ Lecturer at Faculty of pharmacy, Qurina International University, Benghazi, Libya² Student of Faculty of pharmacy, Qurina International University, Benghazi, Libya³ Department of Biomedical Sciences, Libyan Academy for Graduate Studies, Al-Bayda branch, Libya**ARTICLEINFO**

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**ABSTRACT**

Background: Cancer imposes a substantial financial burden on patients in low- and middle-income countries (LMICs). Although cancer treatment is officially provided free of charge in Libya, shortages of essential medicines and limited healthcare services force many patients to incur significant out-of-pocket (OOP) expenses. This study assessed OOP expenditures among patients receiving chemotherapy at Benghazi Medical Center (BMC), Libya.

Methods: A hospital-based cross-sectional study was conducted at BMC between September and October 2025. A total of 300 adult cancer patients were recruited using convenience sampling. Data on OOP expenditures, including medications, private clinic visits, transportation, physiotherapy, food supplements, emergency care, housing, and home modifications, were collected through structured questionnaires and face-to-face interviews.

Results: Most participants were female (63%), and 45.3% were older than 50 years. Nearly all patients purchased prescribed medications privately because of hospital shortages, while most also visited private clinics. Housing or relocation and home modifications represented the largest components of OOP expenditures.

Conclusions: Cancer patients in Benghazi experience substantial OOP expenses despite free public healthcare. Medication shortages, reliance on private services, and treatment-related complications are the main drivers of financial burden. Policy reforms are urgently needed to improve medicine availability and provide effective financial protection for patients.

1. INTRODUCTION

Despite advancements in oncology care in recent decades, 20 million new cancer cases, 9.7 million cancer related deaths and 253 million disability-adjusted life years (DALYs) were estimated for 2021 globally [1-3]. In addition to reduced survival outcomes, patients with cancer also experience symptom burdens; treatment-related side effects; and emotional, psychological, and financial distress [4]. In low- and lower- middle-income countries (LLMICs), delays in health facility presentation, diagnosis, and treatment further affect patients, leading to poor survival outcomes and a considerable decline in health-related quality of life (HRQoL) [5–9]. Measuring HRQoL through patient-reported outcome measures has been used across several treatment fields including cancer to quantify the impact of disease or treatment on patients' lives and daily conditions. HRQoL is a multidimensional construct that encompasses physical, emotional, social, and functional well-being, providing a comprehensive assessment of a patient's overall health status [10]. It serves as a critical metric for evaluating the impact of both disease progression and therapeutic interventions. Most research on measuring patient-reported HRQoL has, however, focused on clinical outcomes, often neglecting the broader psychosocial and economic dimensions of cancer care [11]. High out-of-pocket expenditure (OOPE), loss of income, and limited financial protection exacerbate the financial strain on cancer patients, further diminishing their overall wellbeing and satisfaction with care [12]. Studies from high-income countries (HICs) have shown negative impact on the HRQoL of patients due to financial strain resulting from cancer treatment [13–15]. The increasing cost of cancer care is a global issue faced by all societies around the world. The need for more sophisticated and high technology diagnostic procedures, high cost of the

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new antineoplastic agents such as immunotherapies and targeted therapies, the advances in cancer treatment resulted in long survival of increasing number of patients who may require expensive maintenance therapy for many years, the complexity of care needs large multidisciplinary team to address the needs of cancer patients. All these factors inevitably lead to soaring costs of cancer care. Although the diagnostic workup and treatment of cancer are primarily covered by the government, which constitutes a large portion of the health care budget. However, in the current circumstances of the country that led to supply interruptions, patients may have to bear some of the cost of their treatment. In Libya, one of the well-established strategies for cost saving is the bulk purchasing of drugs from the pharmaceutical industry rather than individual hospital purchasing. Furthermore, there is an increased awareness among the oncology community and policy makers of the high cost of cancer care. In the heart of cost saving approaches there is an emphasis on considering the use of biosimilars in cancer treatment as a proven strategy already adopted by many other countries. This study aims to fill this critical evidence gap by quantifying the OOP expenditure among cancer patients receiving chemotherapy at Benghazi Medical Center (BMC) the largest oncology facility in eastern Libya and to characterize the sociodemographic determinants of this financial burden. The findings are intended to inform evidence-based policy interventions to improve financial protection for cancer patients in Libya [16].

2. METHODS

2.1 Study Design and Setting

A hospital-based cross-sectional study was conducted at the Oncology Department of Benghazi Medical Center (BMC), Benghazi, Libya, from September 29 to October 29, 2025. BMC is the primary tertiary referral hospital in eastern Libya and the main provider of oncology services in the region.

2.2 Study Participants

Adult cancer patients (≥ 18 years) actively receiving chemotherapy at BMC during the study period were eligible for inclusion. A total of 300 participants were enrolled via convenience sampling. Patients who were unable to provide informed consent or who declined participation were excluded. Data were collected from both patients and their accompanying caregivers where applicable.

2.3 Data Collection

Structured questionnaires and face-to-face interviews were employed to collect data on: (1) sociodemographic characteristics (age, sex, education, marital status, employment, income); (2) transportation costs and travel distance/time; (3) medication-related OOP expenses; (4) private clinic and physiotherapy visits; (5) emergency room visits and hospitalizations; and (6) expenditures on food supplements, home modifications, and caregiving. Cost components were estimated in US dollars (USD) based on participant-reported expenditures.

2.4 Ethical Considerations

Ethical approval was obtained from the Department of Pharmacy, Qurina International University, and from Benghazi Medical Center. Written informed consent was obtained from all participants prior to data collection. Confidentiality and voluntary participation were strictly maintained throughout the study.

2.5 Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize the study variables. Categorical variables were presented as frequencies and percentages. Cost components were summarized as absolute values and their proportional contribution to the total out-of-pocket expenditure. The findings are presented in tables to provide a comprehensive descriptive overview of the financial burden experienced by patients.

3. RESULTS

A total of 300 cancer patients participated in the study. Table I summarizes their sociodemographic characteristics. The majority of participants were female (63.0%) and aged over 50 years (45.3%). Most participants had completed a bachelor's degree (36.0%) or a diploma (28.0%). Married individuals constituted 56.7% of the sample. Nearly half of participants (45.3%) reported a monthly family income below LYD 2,000, and 19.0% reported no income. Only 26.7% were employed full-time at the time of the study.

TABLE I. SOCIODEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS (N=300)

Characteristic	Category	n	%
Age (years)	10–19	22	7.3%
	20–29	14	4.7%
	30–39	66	22.0%
	40–49	62	20.7%
	>50	136	45.3%
Sex	Female	189	63.0%
	Male	111	37.0%
Marital Status	Married	170	56.7%
	Single	68	22.7%
	Widowed	34	11.3%
	Divorced	28	9.3%
Family Income/month	<2,000 LYD	136	45.3%
	2,000–5,000 LYD	87	29.0%
	No income	57	19.0%
	>5,000 LYD	20	6.7%
Employment	Working	80	26.7%
	Not working	46	15.3%
	Part-time	63	21.0%
	Housewife	36	12.0%
	Retired	29	9.7%

Out-of-Pocket Expenditure

Table II presents the distribution of OOP cost components as reported by participants. The total estimated OOP expenditure per patient reached approximately USD 46,330. The largest cost drivers were housing-related expenses (buying or renting accommodation near the treatment facility, USD 21,000; 45.3%), home modifications to accommodate illness-related needs (USD 10,000; 21.6%), and physiotherapy (USD 5,000; 10.8%). Medication costs accounted for USD 3,000 (6.5%) and private clinic consultations for USD 4,000 (8.6%).

TABLE II. SUMMARY OF OUT-OF-POCKET COST COMPONENTS REPORTED BY PARTICIPANTS (USD)

Cost Component	Amount (USD)	% of Total
Petrol / private vehicle	\$300	0.6%
Taxi and other transport	\$100	0.2%
Rent (out-of-city patients)	\$100	0.2%
Emergency room / hospital admission	\$1,000	2.2%
Medications (not available at hospital)	\$3,000	6.5%
Private clinic consultations	\$4,000	8.6%
Physiotherapy	\$5,000	10.8%
Food supplements / vitamins	\$300	0.6%
Buying or renting housing	\$21,000	45.3%
Home modifications	\$10,000	21.6%

Cost Component	Amount (USD)	% of Total
Medical equipment	\$1,000	2.2%
Organic food / fruit	\$30	0.1%
Disposables and bed linen	\$50	0.1%
Employed nurse	\$400	0.9%
Employed domestic helper	\$50	0.1%
TOTAL	\$46,330	100.0%

Medication Access and Healthcare Utilization

A striking 97.3% of participants reported purchasing prescribed cancer medications privately because they were unavailable at the hospital pharmacy. An equally high proportion (95.7%) reported visiting private clinics and purchasing over-the-counter medications to manage treatment side effects. Nearly all patients (99.3%) reported purchasing food supplements or vitamins as supportive care.

Almost all participants (99%) experienced side effects related to cancer treatment. Among these, 43.3% required hospital admission, and 97.3% visited the emergency room with 99.3% bearing these costs out of pocket. A large majority (86.7%) also sought physiotherapy services (Figure 1) (see Table III).

TABLE III. HEALTHCARE UTILIZATION AND OOP PAYMENT PATTERNS (N=300)

Variable	Yes n (%)	No n (%)
Purchased prescribed medicines (unavailable at hospital)	292 (97.3%)	8 (2.7%)
Purchased over-the-counter medications	287 (95.7%)	13 (4.3%)
Visited private clinic	287 (95.7%)	13 (4.3%)
Experienced treatment side effects	297 (99.0%)	3 (1.0%)
Admitted to hospital due to side effects	130 (43.3%)	170 (56.7%)
Visited emergency room due to side effects	292 (97.3%)	8 (2.7%)
Paid for emergency / hospital admission	298 (99.3%)	2 (0.7%)
Visited physiotherapist	260 (86.7%)	40 (13.3%)
Purchased food supplements / vitamins	298 (99.3%)	2 (0.7%)

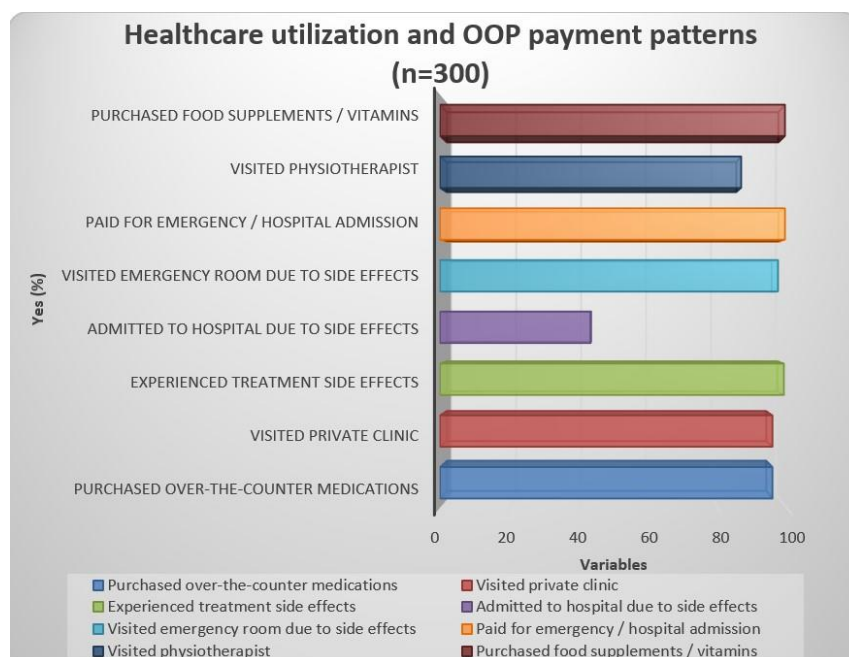


Fig. 1. Healthcare Utilization and Out-of-Pocket (OOP) Payment Patterns among Cancer Patients (n = 300)

Transportation and Access

Most patients (89.7%) relied on a personal or family vehicle for transportation to and from BMC. The majority (56%) lived within 1–5 km of the hospital, while 10% resided 20 km or more away. Most patients (65%) waited 3–6 hours before receiving chemotherapy, and 21.3% waited 6 hours or more. These prolonged wait times represent a significant indirect time cost for both patients and their accompanying caregivers.

4. DISCUSSION

The present study demonstrated that cancer patients receiving chemotherapy at Benghazi Medical Center experience a considerable out-of-pocket (OOP) financial burden despite receiving treatment within the public healthcare system. Although oncology services are officially provided free of charge in Libya, the findings revealed that patients continue to bear substantial personal expenses due to medication shortages, reliance on private healthcare services, emergency care, physiotherapy, transportation, and accommodation costs. These findings indicate that free healthcare coverage alone does not necessarily protect patients from financial toxicity when essential oncology services and medicines are not consistently available.

One of the most striking findings of this study was that 97.3% of patients purchased prescribed anticancer medications from private pharmacies because these drugs were unavailable at the hospital pharmacy. This proportion is considerably higher than that reported in neighboring countries and reflects the severe shortage of oncology medicines within the Libyan healthcare system. Similar observations have been reported in Egypt, where Sharkawy et al. reported that breast cancer patients incurred a mean monthly out-of-pocket expenditure of 2,637 Egyptian Pounds (approximately USD 85.3) despite receiving treatment through governmental oncology centers. Direct medical costs accounted for 1,096 EGP, indirect costs for 1,160 EGP, and transportation and food costs for 381 EGP per month. Furthermore, 32% of Egyptian patients experienced catastrophic financial burden despite public healthcare coverage [17]. Likewise, studies from Jordan have shown that many cancer patients continue to pay part of their treatment costs despite government support, particularly for medications and specialized oncology services [18]. The considerably higher proportion observed in the present study suggests that interruptions in drug availability remain one of the principal drivers of financial toxicity within the Libyan healthcare system.

Housing and accommodation represented the largest component of total out-of-pocket expenditure in the present study, accounting for 45.3% of total costs. This finding differs from several international studies, where medication costs were identified as the largest contributor to cancer expenditure. The remarkably high accommodation costs observed in Libya are likely explained by the centralization of oncology services in Benghazi Medical Center, requiring many patients from distant cities to relocate temporarily during chemotherapy. Similar observations have been reported in India, where accommodation and travel constituted the major non-medical expenses incurred during breast cancer treatment. The Indian study further reported that out-of-pocket payments represented 72.2% of the total treatment costs despite financial assistance being available for 74.4% of patients, while only 8% received full reimbursement, indicating that existing reimbursement mechanisms were insufficient to eliminate the financial burden [19].

These findings are consistent with the current study, where indirect non-medical costs represented a major proportion of patient expenditure. The present study also demonstrated that 95.7% of patients visited private clinics despite receiving chemotherapy within a governmental oncology center. This finding reflects the limited availability of healthcare services within the public sector and suggests that patients often seek additional consultations, investigations, or follow-up care in private facilities. Similar patterns have been described in Egypt, where patients continued to incur considerable direct and indirect healthcare costs despite treatment in governmental facilities [17]. Comparable observations have also been reported in Jordan, where treatment costs increased substantially with disease progression and treatment remained the major cost driver [18].

Almost all participants experienced treatment-related complications requiring emergency care, with 97.3% reporting emergency room visits and nearly all patients paying for emergency-related expenses. Although emergency care is often overlooked in economic evaluations, previous pharmaco-economic studies have consistently demonstrated that complications requiring emergency visits or hospitalization substantially increase the overall cost of cancer treatment. These findings emphasize that financial protection policies should include supportive and emergency care in addition to chemotherapy itself.

Physiotherapy represented another important source of expenditure, accounting for 10.8% of total out-of-pocket costs, while 86.7% of patients required physiotherapy services. Similar findings have been reported in Poland, where 90.6% of breast cancer patients incurred additional expenses despite universal health coverage. The most common expenditures included transportation (85.8%), dietary supplements (77.4%), private consultations, rehabilitation, and prescription medications [20]. These findings demonstrate that supportive and rehabilitative care continues to impose a significant financial burden even in healthcare systems providing publicly funded cancer treatment.

The financial burden observed in the present study was further aggravated by the socioeconomic characteristics of the participants. Nearly half of the patients reported a monthly household income below LYD 2,000, whereas approximately

one-fifth had no regular income. Under these circumstances, even moderate treatment-related expenses may become catastrophic. Similar evidence has been reported from the Philippines, where 90.9% of patients experienced catastrophic health expenditure and 79% demonstrated treatment non-adherence because of financial constraints [21]. Likewise, the Indian prospective study reported that although 74.4% of patients received some form of financial assistance, only 8% obtained full reimbursement, while patients still paid an average of USD 2,551 out-of-pocket, representing 72.2% of the total treatment costs [19]. These findings highlight that financial assistance alone may not adequately protect cancer patients from severe economic hardship.

Although the present study evaluated patient expenditure rather than healthcare system costs, its findings are also supported by evidence from Saudi Arabia. Alghamdi et al. reported that the average cost of breast cancer management increased dramatically from USD 14,249 for stage I disease to USD 81,489 for stage IV disease, with medications representing the principal driver of healthcare expenditure and targeted therapies accounting for 67% of medication costs. Similarly, a Jordanian cost analysis reported that treatment costs increased progressively from USD 8,404 in stage I disease to approximately USD 13,518 in stage IV disease, with treatment costs representing the major cost driver across all disease stages [18]. These observations indicate that increasing disease severity substantially increases healthcare expenditure regardless of the healthcare system, emphasizing the importance of early diagnosis and uninterrupted treatment availability. Overall, the findings of the present study are consistent with evidence from neighboring countries and other low- and middle-income countries demonstrating that cancer treatment imposes a considerable financial burden on patients even within publicly funded healthcare systems. Nevertheless, the Libyan situation appears to be characterized by an exceptionally high dependence on private medication purchases (97.3%), extensive utilization of private healthcare services (95.7%), and remarkably high accommodation costs (45.3% of total expenditure) resulting from centralized oncology services. Compared with Egypt, where 32% of patients experienced catastrophic financial burden [17], and India, where out-of-pocket payments represented 72.2% of treatment costs [19], the present study demonstrates an even greater dependence on private expenditure driven primarily by medication shortages and limited-service availability. These findings underscore the urgent need to improve the national supply of oncology medicines, decentralize cancer treatment services, strengthen financial protection mechanisms, and incorporate pharmacoeconomic evidence into future national cancer control strategies to reduce the economic burden experienced by patients with cancer.

5. STRENGTHS OF THE STUDY

This study has several strengths. First, it is among the first studies to quantify cancer-related out-of-pocket (OOP) expenditure among patients receiving chemotherapy in Libya, addressing an important gap in the national literature. Second, the study included a relatively large sample of 300 participants recruited from the largest oncology referral center in eastern Libya, enhancing the reliability of the descriptive findings. Third, the study comprehensively assessed a wide range of direct medical and non-medical out-of-pocket expenses, including medications, transportation, accommodation, physiotherapy, emergency care, food supplements, home modifications, and caregiving costs. Finally, the findings provide valuable baseline evidence that can support future pharmacoeconomic research and inform healthcare policy aimed at reducing the financial burden of cancer care in Libya.

6. CONCLUSIONS

Cancer treatment in Benghazi generates catastrophic out-of-pocket expenses for patients, driven primarily by medication shortages, enforced reliance on private services, treatment-related complications, and housing costs associated with treatment access. These findings expose a profound gap between the theoretical entitlement to free public cancer care and the financial reality faced by patients and their families in Libya. To address this crisis, targeted policy interventions are urgently required, including: (1) sustainable procurement and supply chain systems for essential oncology medicines; (2) expansion of health insurance coverage to include non-medical and indirect cancer care costs; (3) development of patient financial navigation services within public oncology centers; and (4) integration of pharmacoeconomic analysis into national cancer control planning. These measures are essential prerequisites for achieving equitable, patient-centered cancer care in Libya.

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Conflicts of Interest:

The authors declare that they have no conflicts of interest in relation to this work.

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List of Abbreviations

BMC: Benghazi Medical Center | CHE: Catastrophic Health Expenditure | COI: Cost-of-Illness | LMICs: Low- and Middle-Income Countries | OOP: Out-of-Pocket | USD: United States Dollar | LYD: Libyan Dinar

Ethics approval and consent to participate:

Ethical approval was obtained from the Department of Pharmacy, Qurina International University, and Benghazi Medical Center. Written informed consent was obtained from all participants.

Competing interests:

The authors declare no competing interests.

Authors' contributions:

MAZ: data collection, analysis, and manuscript preparation. AAT: study supervision, manuscript review and editing. KRM: study supervision, manuscript review and editing. All authors read and approved the final manuscript.

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