Original Article

Prevalence, Patterns and Hepatobiliary Sub-analysis of Malignancies at a Tertiary Care Hospital in Rawalpindi: A Retrospective Observational Study (2022–2024)

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Abstract

Objective: To assess the magnitude and distribution of malignant cases attending the Oncology Care Clinic of a tertiary care hospital in Rawalpindi, and to perform a comparative sub-analysis of hepatobiliary malignancies with respect to tumour type, stage, and viral hepatitis burden by sex and geographic origin.

Methods: A retrospective observational study examined all confirmed malignancy registrations at the Rawalpindi Medical University (RMU) Oncology Care Clinic between August 2022 and July 2024. A hepatobiliary sub-cohort (n = 99) was analysed separately using Chi-square, Fisher exact, and Mann–Whitney U tests to compare tumour characteristics by sex and area of residence. Statistical significance was set at $p < 0.05$.

Results: Five hundred patients were included in the main cohort (mean age 50.1 years; 61.8% female). Gynaecological cancers predominated (29.0%), followed by hepatobiliary (19.8%) and haematological (19.0%) malignancies. In the hepatobiliary sub-cohort (n = 99), hepatocellular carcinoma (HCC) accounted for 73 cases (73.7%), Pancreatic Carcinoma for 18 (18.2%), and other tumours for 8 (8.1%). Males constituted 71.7% of this group. Hepatitis C virus (HCV) was the predominant underlying chronic liver disease, present in 65 patients (65.7%). Advanced stage presentation (stage III or IV) was recorded in 70 patients (70.7%). No statistically significant differences were found in tumour type ($p = 0.431$), late-stage presentation ($p = 0.260$), or HCV burden ($p = 0.221$) when compared by sex, nor in late-stage presentation by area of residence ($p = 0.475$). Stage distribution across tumour types was also comparable ($p = 0.953$).

Conclusion: Cancers of the female reproductive tract emerged as the leading group at our centre. Within the hepatobiliary subset, HCV carriage was very common and most patients arrived late. We did not see meaningful differences when we split this subset by sex or by where patients lived, which points to a delay that runs across the whole catchment rather than affecting any one subgroup. The implication for service planning is broad: screening and referral pathways need to be reworked for the population as a whole, not aimed at narrower risk pockets.

Keywords: malignancy; hepatocellular carcinoma; hepatitis C; late-stage presentation; cancer registry; retrospective study; Rawalpindi

Introduction

International Agency for Research on Cancer showed in GLOBOCAN figures that around 23.6 million new cancer cases were recorded in 2019 worldwide. Moreover, roughly 10.0 million cancer-related deaths were recorded in the same year. This shows that cancer is just behind cardiovascular disease as a cause of mortality.[1] All over the world, disability-adjusted life years (DALYs) climbed steadily between 2010 and 2019. The steepest rise was observed in countries where the socio-economic index scores are very low. These are the places where the screening and prompt treatment remain hard to reach.[2]
In the United States, forecasts for 2024 pointed to about 2 million people being newly diagnosed with cancer with approximated death toll of 612,000.[3] Overall cancer mortality has been on a downward trend in the US since the early 1990s. This shift is largely

attributed to falling tobacco use, better screening, and improved systemic treatments. The overall picture is not uniform as pancreatic, uterine and liver malignancies kept increasing from 2015 to 2019.[3]

In the Pakistan, cancer burden is continuously on rise. The national registry showed that from 1994 to 2021, there were 111,941 malignant case reports, with breast cancer topping the list.[4] In the paediatric group acute lymphoblastic leukaemia dominated, whereas adult patients more often presented with breast, colorectal, or hepatobiliary disease.[4,5]

One feature that sets Pakistan apart is its hepatitis C virus (HCV) seroprevalence, generally placed at 4–8% of the population overall, with Rawalpindi and the wider Punjab among the worst-hit pockets.[6] Because of this, our hepatobiliary cancer profile looks rather different from what is reported in high-income settings.

The Oncology Care Clinic at Rawalpindi Medical University (RMU), established in August 2022, is one of the few dedicated outpatient oncology facilities in northern Punjab. Punjab as a whole has only 0.027 medical oncologists per 100,000 population, with each specialist managing between 1,300 and 1,500 patients annually, and fewer than one in four residents has access to radiotherapy services.[7] Retrospective data from this clinic thus offers a valuable window into the real-world cancer burden of a population that is predominantly urban-to-semi-urban but geographically dispersed.

The present study reports the overall prevalence and system-wise distribution of malignancies registered at the RMU Oncology Care Clinic over two years. In addition, because hepatobiliary tumours were the second most common system involved and are particularly relevant to Pakistan's HCV epidemic, a pre-specified sub-analysis of hepatobiliary cases was conducted to examine tumour-type distribution, stage at presentation, and chronic viral hepatitis burden, with comparative analyses by sex and geographic origin.

Objectives

(i) To determine the prevalence and system-wise distribution of malignancies registered at the RMU Oncology Care Clinic between August 2022 and July 2024.

(ii) To characterise the hepatobiliary sub-cohort with respect to tumour type, AJCC stage at presentation, and underlying chronic viral hepatitis status.

(iii) To compare hepatobiliary tumour patterns—including tumour type, advanced stage presentation, and HCV/HBV prevalence—between males and females and between patients from Rawalpindi and those from other districts.

Materials And Methods

Study design and setting. This is a retrospective observational study conducted at the RMU Oncology Care Clinic, a tertiary care facility under the Department of Cancer Care Unit, Rawalpindi Medical University, Pakistan. Data span a two-year period from 1 August 2022 to 31 July 2024. The study was reviewed and approved by the Ethical Review Board of Rawalpindi Medical University (approval reference: 71-Med-RMU-24) and was conducted in accordance with the principles of the Declaration of Helsinki, Good Clinical Practice guidelines, and Institutional ethical standards. Because data were collected as part of routine clinical audit from anonymised records, individual patient consent was waived by the review board.

Participants. All consecutive patients with a confirmed histological or radiological diagnosis of malignancy registered at the RMU Oncology Care Clinic between 1 August 2022 and 31 July 2024 were included in the study. Cases with non-malignant, borderline, or in-situ disease were excluded. A pre-specified hepatobiliary sub-cohort was extracted, comprising all patients whose primary tumour site fell within the liver, biliary tract, or pancreas.

Data collection. Patient records were retrieved from the medical records division using a standardised proforma that captured: demographic details (age, sex, residential address); source of referral to clinic; method of diagnosis (histopathology, cytology, imaging, or clinical); primary tumour site and histology; AJCC staging where available; and chronic active hepatitis (CAH) status (HCV, HBV, or none) for hepatobiliary cases. Data were entered initially into Microsoft Excel and transferred for statistical analysis.

Statistical analysis. Statistical analysis was performed using IBM SPSS Statistics version 25.0. Continuous variables were first assessed for normality using the Shapiro–Wilk test. Age was normally distributed in males ($W = 0.975$, $p = 0.171$) but deviated from normality in females ($W = 0.864$, $p = 0.002$); therefore, age was summarised as median with interquartile range (IQR) and compared between groups using the Mann–Whitney U test. Categorical variables were presented as frequencies and percentages and compared using Pearson's Chi-square test. Fisher's exact test was applied when any expected cell count fell below 5. For the hepatobiliary sub-analysis, comparisons were made between males and females and between patients residing in Rawalpindi versus those from other districts. A two-tailed p-value of less than 0.05 was considered statistically significant. No corrections for multiple comparisons were applied given the exploratory nature of the sub-analysis; all p-values should therefore be interpreted accordingly.

Reporting standard and handling of missing data. The manuscript was prepared in line with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist for cross-sectional and cohort studies, and the completed STROBE checklist accompanies this submission. Records were treated using a complete-case approach: variables that were absent or could not be retrieved from the original chart (most commonly formal AJCC stage in patients with overtly advanced disease, and HBV/HCV serology in a small subset) were left as missing rather than imputed, and the patient was retained for all analyses for which the relevant data were available. No multiple imputation or other model-based substitution was performed. Where a denominator differs from the full cohort because of missing data, this is stated in the corresponding table footnote.

Sample size considerations. No a-priori sample size was calculated, since the study is descriptive and the cohort is defined by all consecutive registrations during a fixed two-year window. A post-hoc sensitivity calculation was, however, undertaken to indicate what could realistically be detected. For the main hepatobiliary comparison of late-stage presentation by sex (male 74.6% vs female 60.7%; n = 71 and n = 28 respectively), the achieved power at $\alpha = 0.05$ (two-sided) is approximately 0.21, meaning that the present sample can confidently detect only large absolute differences (around 25 percentage points or more) in this comparison. Negative results for the smaller subgroups should therefore be read as "no clear difference at this sample size" rather than as evidence of equivalence.

Results

Overall cohort (n = 500).

Over the two-year window, 500 patients with confirmed cancer were entered into the registry. The mean age of the cohort was 50.1 years (range 11–89; median 52.5; IQR 37–61). Female gender was dominant as 309 patients (61.8%) were females while 191 (38.2%) were males. The geographical distribution showed that 30.1% patients belonged to Rawalpindi while rest of the patients were from Taxila (19.5%), Chakwal (12.5%), Azad Jammu and Kashmir (11.7%), Attock (7.5%), Mianwali (7.5%), Jhelum (6.7%) and Islamabad (5.4%). This shows the draining area has wide semi-urban and rural belt rather than only the city itself.

The 61–70-year age range contributed most cases (n = 107; 21.4%), followed closely by the 51–60 years age cohort (n = 101; 20.2%). The system-wise breakdown is shown in Table 1. The female reproductive tract malignancies constituted 29.0% (n = 144) and within them ovarian disease was the dominant subtype (n = 109; 75.7%). The second most common malignancies were from hepatobiliary system (n = 99; 19.8%), with haematological cancers (n = 95; 19.0%) close behind. The haematological cohort were nearly equally split between lymphomas (49.5%) and leukaemias (44.2%). Breast cancer added a further 30 cases (6.0%). The data about organ wise malignancies showed that the ovary topped the list (n = 109; 21.8%), with the liver next (14.4%).

Hepatobiliary sub-cohort (n = 99).

The hepatobiliary sub-cohort comprised 99 patients. Their median age was 59 years (IQR 52–66; range 35–89 years). Males constituted the majority (n = 71; 71.7%) and females accounted for 28 patients (28.3%). The predominant age group was 46–60 years (n = 52; 52.5%), followed by 61–75 years (n = 33; 33.3%), those older than 75 years (n = 10; 10.1%), and those younger than 45 years (n = 4; 4.0%). Patients resident in Rawalpindi district constituted 68.7% (n = 68) of the sub-cohort.

Hepatocellular carcinoma was the most common tumour (n = 73; 73.7%), followed by carcinoma of the pancreas (n = 18; 18.2%) and other hepatobiliary tumours (n = 8; 8.1%), the last category encompassing cholangiocarcinoma and carcinoma of the gall bladder. Chronic hepatitis C was the most prevalent underlying aetiology, identified in 65 patients (65.7%), while hepatitis B was present in 14 (14.1%), and 20 patients (20.2%) had no detectable chronic viral hepatitis.

Regarding stage at presentation, 10 patients (10.1%) had Stage I disease, 19 (19.2%) Stage II, 15 (15.2%) Stage III, and 55 (55.6%) Stage IV. Combined advanced stage (III or IV) presentation was recorded in 70 patients (70.7%). A tissue biopsy was performed in 57 patients (57.6%); the remaining 42 (42.4%) were managed on radiological or clinical grounds.

Comparative analyses by sex and area of residence are presented in Tables 2 and 3. Median age did not differ significantly between males (58 years; IQR 51–66) and females (59 years; IQR 55–64) (Mann–Whitney U = 937, p = 0.660). The distribution of tumour types was similar across sexes ($\chi^2 = 1.682$, df = 2, p = 0.431). The proportion with late-stage disease was 74.6% in males and 60.7% in females, a difference that did not reach statistical significance ($\chi^2 = 1.270$, df = 1, p = 0.260). HCV was the most prevalent chronic infection in both sexes (60.6% in males vs 78.6% in females), and the overall distribution of hepatitis status across sexes was not significantly different ($\chi^2 = 3.021$, df = 2, p = 0.221). Advanced stage presentation did not differ between patients from Rawalpindi and those from other districts (Fisher exact: OR = 1.528, p = 0.475). Stage distribution was also comparable across the three tumour types (HCC, Pancreatic Carcinoma, others) ($\chi^2 = 1.598$, df = 6, p = 0.953).

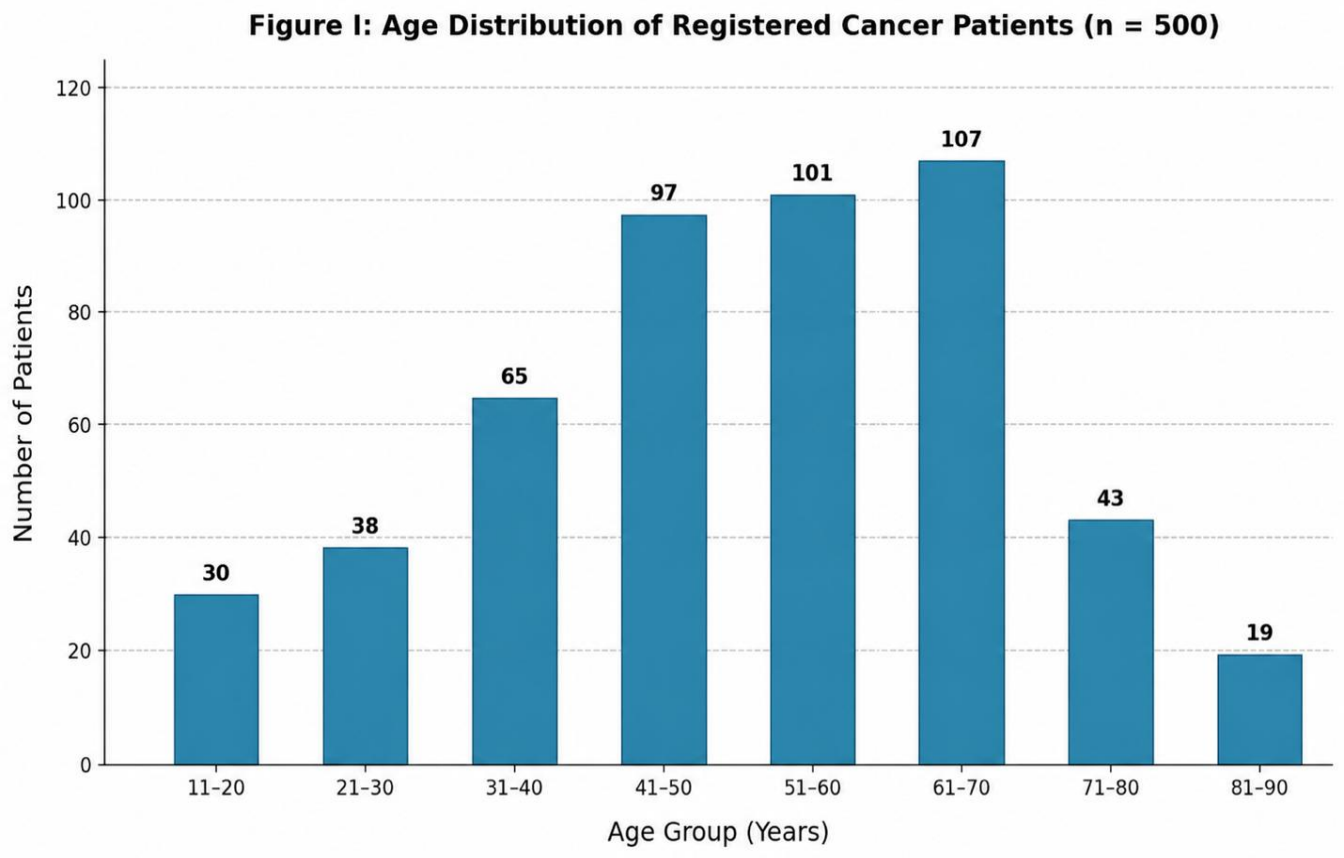

Figure 1: Age distribution of the overall cohort (bar chart)

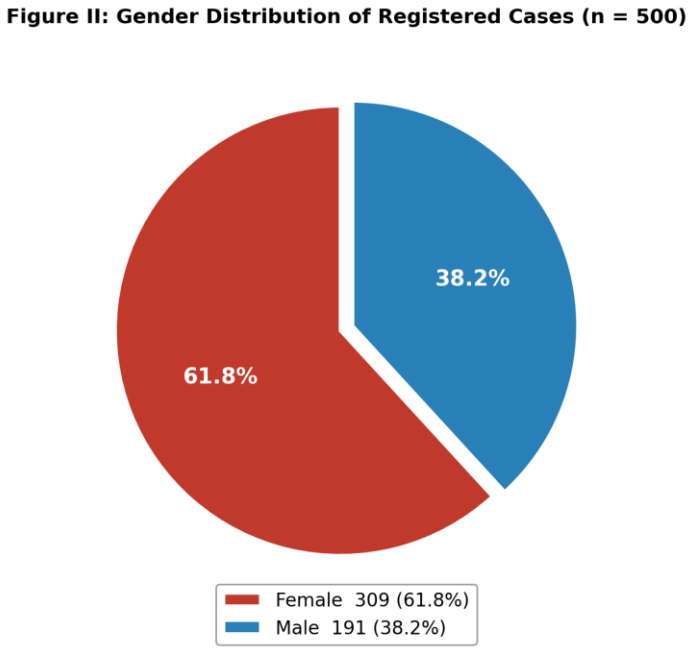

Figure 2: Gender distribution of registered cases (pie chart)

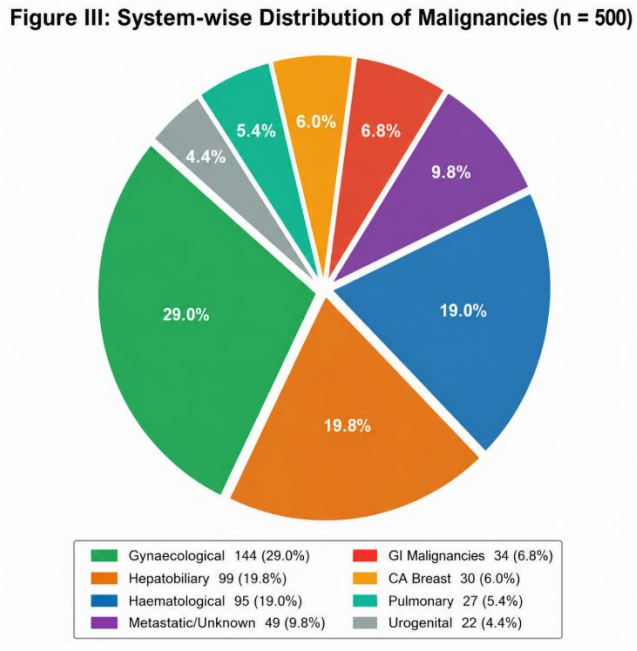

Figure 3: System-wise case distribution (pie chart).

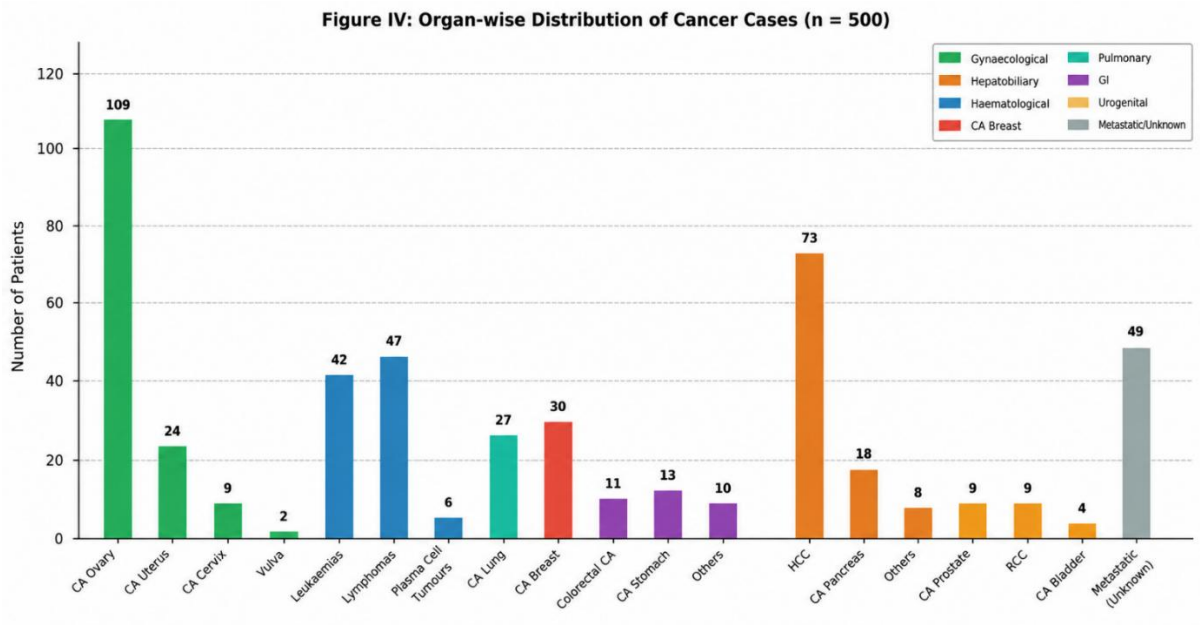

Figure 4: Organ-wise case distribution (bar chart).

Table 1: System-wise distribution of registered malignancies (n = 500). Percentages marked with an asterisk (*) are within-system proportions

Sr.	System / Tumour	n	%
1	Gynaecological Cancers	144	29.0
	Ovarian	109	75.7*
	Uterine	24	16.7*
	Cervical	9	6.3*
	Vulval	2	1.4*
2	Hepatobiliary Malignancies	99	19.8
	Hepatocellular Carcinoma (HCC)	73	73.7*
	Pancreatic Carcinoma	18	18.2*
	Others	8	8.1*
3	Haematological Malignancies	95	19.0
	Lymphomas	47	49.5*
	Leukaemias	42	44.2*
	Plasma Cell Tumours	6	6.3*
4	GI Malignancies	34	6.8
	CA Stomach	13	38.2*
	Colorectal CA	11	32.4*
	Others	10	29.4*
5	CA Breast	30	6.0
6	Pulmonary (CA Lung)	27	5.4
7	Urogenital CA	22	4.4
	CA Prostate	9	40.9*
	Renal Cell CA (RCC)	9	40.9*
	CA Bladder	4	18.2*
8	Metastatic (Unknown Primary)	49	9.8
	Total	**500**	**100**

Table 2: Comparative characteristics of the hepatobiliary sub-cohort by sex (n = 99). †Mann–Whitney U test. ‡Chi-square test. §Fisher exact test

Variable	Male n=71 (%)	Female n=28 (%)	p-value
Age, years – median (IQR)	58 (51–66)	59 (55–64)	0.660†
Malignancy type			0.431‡
HCC	50 (70.4)	23 (82.1)	
Pancreatic Carcinoma	14 (19.7)	4 (14.3)	
Others	7 (9.9)	1 (3.6)	
Late stage (III+IV)	53 (74.6)	17 (60.7)	0.260‡
Chronic viral hepatitis			0.221‡
HCV	43 (60.6)	22 (78.6)	
HBV	12 (16.9)	2 (7.1)	
None	16 (22.5)	4 (14.3)	
Biopsy performed	44 (62.0)	13 (46.4)	0.125§

Table 3: Stage distribution across hepatobiliary tumour types (n = 99). ‡Chi-square test

Stage	HCC n=73 (%)	Pancreatic Carcinoma n=18 (%)	Others n=8 (%)	p-value
Stage I	8 (11.0)	1 (5.6)	1 (12.5)	0.953‡
Stage II	14 (19.2)	4 (22.2)	1 (12.5)	
Stage III	11 (15.1)	2 (11.1)	2 (25.0)	
Stage IV	40 (54.8)	11 (61.1)	4 (50.0)	
Late stage (III+IV)	**51 (69.9)**	**13 (72.2)**	**6 (75.0)**	

Discussion

Cancer epidemiology in low and middle-income countries (LMICs) is shaped by a combination of delayed health-seeking behaviour, limited access to screening programmes, and a high prevalence of infection-related carcinogenesis. The present study, drawing on two years of retrospective registration data from a newly established oncology clinic in Rawalpindi, reflects several of these patterns while also providing granular hepatobiliary data that are of direct clinical and public-health relevance to northern Pakistan.

The predominance of gynaecological malignancies—accounting for nearly three in ten cases—with ovarian carcinoma representing three quarters of that group is a finding shared with several South Asian registry reports. A cancer epidemiology study from Lahore covering 2010–2015 similarly identified female reproductive cancers as a leading diagnostic category, with breast cancer carrying the highest age-standardised incidence rate (ASIR) among women (77.3 per 100,000).[8] In the present cohort, however, the most heavily represented system was gynaecological rather than breast; this may partly reflect referral patterns from gynaecology units within the host hospital and should not be interpreted as a population-level incidence estimate.

Within the haematological group, lymphomas (49.5%) and leukaemias (44.2%) sat at roughly the same share and is consistent with published Pakistani paediatric and adult data sets. A report from Khyber Pakhtunkhwa, for instance, found that leukaemias drove most of the paediatric and adolescent haematological caseload there, with age-standardised incidence rates of 4.0 per 100,000 for girls and 6.1 per 100,000 for boys.[9] Because our patients were mainly adults (median age 52.5 years), we have to be careful when comparing our results with other datasets. Still, the equitable distribution of both subtypes in our series indicates a generally consistent regional picture.

Hepatobiliary findings.

Among all the malignancy stats in our study, the hepatobiliary subgroup probably matters most to local practice. Nearly two thirds of these patients carried chronic HCV infection (65.7%). This figure is consistent with the already known facts about Pakistan. The seroprevalence of HCV in Pakistan is 4.5% to 8.0%, and in some areas of Punjab province it reaches up to 10%.[6,10] Because the pathophysiology of HCV infection involves chronic inflammation, fibrosis, and eventually cirrhosis, it is not surprising that HCC accounted for almost three quarters (73.7%) of our hepatobiliary cases, as similar proportions have been reported in other tertiary centres in the region.[10]

About seven in ten patients (70.7%) presented with stage III or IV disease, and almost 56% of the group were already at stage IV. Although these numbers are worrying, they are not unexpected. HCC and pancreatic cancer usually cause few symptoms until the disease is already advanced or has spread. Moreover, the six-monthly ultrasound and alpha-fetoprotein checks advised for patients with HCV-related cirrhosis are rarely carried out in our healthcare

settings, except few specialist liver centres. As a result, most patients arrive too late for options such as resection, ablation or transplantation, and we are left mainly with palliative systemic treatment or supportive care.

One clear message from our subgroup analysis is that there was little difference between groups. Advanced-stage disease was almost as common in men as in women (74.6% vs 60.7%, p = 0.260), and in patients from Rawalpindi compared with those coming from other districts (68.4% vs 64.5%, p = 0.475). This might look like an even picture but it means that almost nobody is being diagnosed early. Interestingly, there was no real difference between people living near the clinic and those coming from farther away. Simply living close by did not lead to earlier diagnosis, which suggests that the main delay is happening earlier on, at the level of primary-care recognition and referral.

In the same vein, neither tumour type (p = 0.431) nor stage spread across the three tumour categories (p = 0.953) co-varied with sex or with the specific diagnosis (HCC, pancreatic cancer or others). These non-significant findings remain clinically meaningful; they demonstrate that at our centre, hepatobiliary cancer cannot be carved into smaller, higher-risk demographic pockets for the purposes of early detection. A broad, population-wide approach to HCV testing and HCC surveillance is therefore more likely to move the stage curve than any narrowly targeted strategy.

HCV was slightly more frequent among the female patients (78.6%) than the male ones (60.6%), but the gap did not clear statistical significance (p = 0.221), most likely because the female subgroup was modest in size (n = 28). The signal is worth following up though — household-level HCV transmission via shared razors and through unsafe injections during obstetric care has been described before in Pakistani women, and could in principle account for a sex-skewed pattern. Confirming or ruling that out will need bigger, multicentre samples.

Context and comparison. In a cross-sectional series of 1,656 cancer patients from Bangladesh, the top three diagnoses in men were lung (9.6%), leukaemia (9.4%) and lymphoma (9.0%); in women they were breast (28.1%), thyroid (16.1%) and cervical cancer (12.2%).[11] Our cohort looks rather different — both hepatobiliary and haematological disease feature high in men and women alike, which is in keeping with Pakistan's heavy HCV exposure; while in women, female reproductive tract malignancies are high in number. A Chinese series from Guiyang has likewise reported liver and gynaecological cancers among the leading diagnoses in women, giving our findings some cross-regional grounding.[12]

Limitations.

A few caveats should be kept in mind. To start with, this is a retrospective study built on clinic registration data, so it only captures patients who were either referred in or who walked in on their own — it cannot generate population-level incidence rates. Second, AJCC stage was logged only where the original notes contained it, and some patients with very advanced disease may never have been formally staged; that introduces a degree of bias into any stage-based comparison. Third, with n = 99 the hepatobiliary subgroup is small for the comparisons we ran, and the negative p-values should not be read as a clean no-difference verdict — a larger series could still expose differences with real clinical weight. Fourth, the work comes from a single Rawalpindi centre, so the picture may not transfer cleanly to rural, tribal or southern Pakistani populations where both HCV seroprevalence and care-seeking behaviour differ. Fifth, breast cancer cases were getting registered mainly in the registry under the surgery department, so our study cannot exactly document the actual burden of breast cancer being presented to this medical centre. Finally, cause-specific survival and treatment-outcome data were not systematically captured in the registry, so those analyses had to be left aside.

Conclusions

Over the two years of registrations at this tertiary clinic, cancers of the female reproductive tract were the largest group (29.0%), with hepatobiliary (19.8%) and haematological (19.0%) cancers close behind. Within the hepatobiliary group, HCC was easily the most common diagnosis (73.7%), HCV was the main underlying cause (65.7%), and about seven in ten patients presented with advanced-stage disease. The pattern of tumour types, stage at diagnosis, and viral hepatitis status was similar in men and women and in patients from Rawalpindi compared with those from other districts, which suggests that delays in diagnosis are uniform among all subgroups and regions. For clinical practice, this points toward the need for a broad HCV-to-HCC surveillance pathway and earlier referral to oncology centres. Future prospective studies that also record full staging and treatment outcomes will be important to allow proper survival analysis.

Author Information

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