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IMAGING PATTERNS OF LIVER DISEASES DIAGNOSED BY ULTRASOUND GUIDED LIVER BIOPSIES AT MOI TEACHING AND REFERRAL HOSPITAL
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IMAGING PATTERNS OF LIVER DISEASES DIAGNOSED BY ULTRASOUND GUIDED LIVER BIOPSIES AT MOI TEACHING AND REFERRAL HOSPITAL

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ABSTRACT

Background: **Liver biopsy is useful in making diagnosis, assessing the prognosis of liver diseases and in making decisions for therapeutic management. Interventional radiology is a rapidly growing subspecialty, with very few personnel, more so in developing countries.**

Objective: **To describe the imaging patterns of liver diseases diagnosed by ultrasound guided liver biopsies at Moi Teaching and Referral Hospital.**

Design: **Cross sectional study**

Setting: **Moi Teaching and Referral Hospital (MTRH), Radiology and Imaging Department and Histopathology laboratory over one-year period from July 1st 2013 to June 30th 2014**

Subjects**: All consenting patients referred for ultrasound guided liver biopsy were studied with a sample size of 36 patients.**

Results: **Hepatocellular carcinoma (HCC) was the commonest pathology that was diagnosed (n=21). Most HCC lesions were larger than 5cm (n=18, 90%) and 85% of these lesions were heterogeneous on ultrasonography.**

Conclusions: **Hepatocellular carcinoma larger than 5cm and heterogenous in pattern is the commonest liver lesion diagnosed in Moi Teaching & Referral Hospital. A larger study is recommended**

INTRODUCTION

Histological assessment of the liver, and thus, liver biopsy, is a core investigation tool in the evaluation and subsequent management of patients with liver disease. It has long been considered to be an integral component of the clinician's diagnostic armamentarium. Although sensitive and relatively accurate blood tests used to detect and diagnose liver disease have now become widely available, it is likely that liver biopsy will remain a valuable diagnostic tool (1). Historically, liver biopsy was used almost exclusively as a diagnostic tool (2, 3). However, as the result not only of new natural history data and the introduction of many new therapies for patients with liver disease, liver biopsy and histological assessment of the liver has now taken on an important role in clinical management. Liver biopsy currently has three major roles: diagnosis, assessment of prognosis (disease staging), and/or assisting in making therapeutic management decisions (3). There are several methods available for obtaining liver tissue: percutaneous biopsy, trans-jugular biopsy, laparoscopic biopsy, or fine needle aspiration guided by ultrasonography or computed tomography (CT) (4).

Traditionally, liver biopsy has been performed by a physician as a bedside procedure using the so-called blind biopsy. The site was identified based on the clinical acumen of the clinician, which depended highly on the physical examination of the patient. Initially, palpation of the site, available history as well as clinical investigations were carried out. This method was associated with many difficulties. Identification of the organ might be difficult especially in the face of other complications such as ascites or anatomical variation in individual's liver. This could result in failure to obtain hepatic tissue during biopsy without imaging. The other disadvantage of blind biopsy is that the quality of biopsy might be compromised, and fragmentation would occur. In everyday clinical practice, an increasing number of liver biopsies are performed by radiologists under ultrasound control (4, 5). Ultrasonography, as well as being a good screening test for liver disease (5), allows selection of the optimal puncture site before performing biopsy. The use of ultrasonography by marking the site for percutaneous biopsy has been reported to increase diagnostic yield and decrease complication rates (6). Currently ultrasound guidance is used in more than half of percutaneous liver biopsies. This has led to a decrease in the rate of severe complications by one third (7).

Interventional radiology, being relatively new in Kenya, there is minimal published data on features of lesions visualized during ultrasonography and confirmed histopathologically.

History of liver biopsy: The first liver biopsy was performed by the German physician Paul Ehrlich in 1883. However, it was Schüpfer in 1907 who published the first liver biopsy series (8). Percutaneous liver biopsy was first reported in the 1920s (9). The trans jugular approach was pioneered by radiologist Charles Dotter in the 1970s (9). Liver biopsy was revolutionized by Menghini in 1958 with development of the "one-second needle biopsy of the liver" (10).

Characteristics of liver diseases: Among primary liver cancers, hepatocellular

carcinoma (HCC) represents the major histological subtype, accounting for 70% to 85% of the total liver cancer burden worldwide (11). A review of liver biopsies over a three-year period in Zambia revealed 166 cases of carcinoma of the liver. Hepatocellular carcinoma constituted the commonest malignant tumor in male Zambians (12).

A study done by Mwangi *et al*. in Kenya showed that Hepatocellular carcinoma is the third most common malignancy in Kenyan males occurring with a peak incidence at 40 years of age (13).

The high Hepatocellular carcinoma rates in parts of Asia and sub-Saharan Africa largely reflect the elevated prevalence of chronic hepatitis B virus (HBV) infection, with over 8% of the populations in these regions chronically infected with the virus. A review by Karoney and Siika on HCV infection in Africa revealed a prevalence rate of 5.3% and Kenya's estimated prevalence at 1.7% (14).

Sonographic characteristics of liver diseases: Sonographic patterns of liver diseases are classified as hypoechoic, isoechoic, and hyperechoic or heterogenous in relation to adjacent liver tissue. Different studies have compared the sonographic findings with the histological findings in hepatocellular carcinoma.

MATERIALS AND METHODS

A cross sectional study conducted at Moi Teaching and Referral Hospital (MTRH) Kenya, from July 2013 to June 2014. The target population was all patients referred to the radiology department at MTRH for ultrasound guided liver biopsies. All the patients recruited were followed up, and a histological diagnosis obtained from the MTRH Histopathology department for confirmation of diagnosis. Participants whose lesions were sonographically inaccessible, unsafe to biopsy and those with unsuitable international normalized ratio (INR) values of more than 1.5 were excluded from the study.

The technique used was ultrasound guided percutaneous core biopsy using a non-suction tru-cut biopsy needle. Some patients had ascites. The ascites was drained prior the biopsy procedure and the drain remained in situ after the procedure. The children were mildly sedated by a paediatrician on site.

Informed consent was sought from all participants. A verbal assent was sought from children. Confidentiality was maintained.

***Data Analysis*:** Data was collected prospectively from the patients. A structured data entry form was used to gather all the information. Data was analyzed using descriptive statistics and with the aid of STATA version 12 special edition. The test for association used was Pearson's Chi Square test.

RESULTS

Socio-demographic characteristics: There were 36 study participants who were recruited into the study. 22(61%) participants were female. The age distribution of the participants was as presented in Figure 1. More than half of the participants, 19(53%) were aged above 40 years with those aged at least 60 years contributing the greatest proportion in this group. Among those aged below 40 years were those aged between 30 and 40

years who contributed the largest, 70%, among this group of participants.

This was further analysed for participants who had HCC. 13 (61%) of the participants were females. The age distribution of patients with HCC showed two peaks. The participants aged between 30 to 40 years contributed the highest percentage, 43%. The second peak was among participants above 60 years who accounted for 33%.

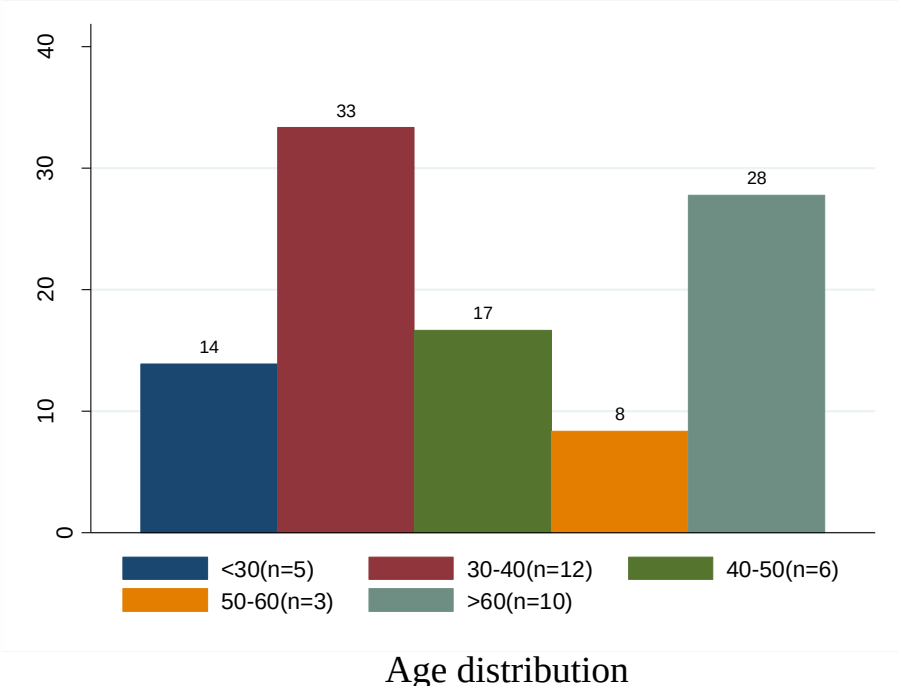

Figure 1: Distribution of the participants by age group

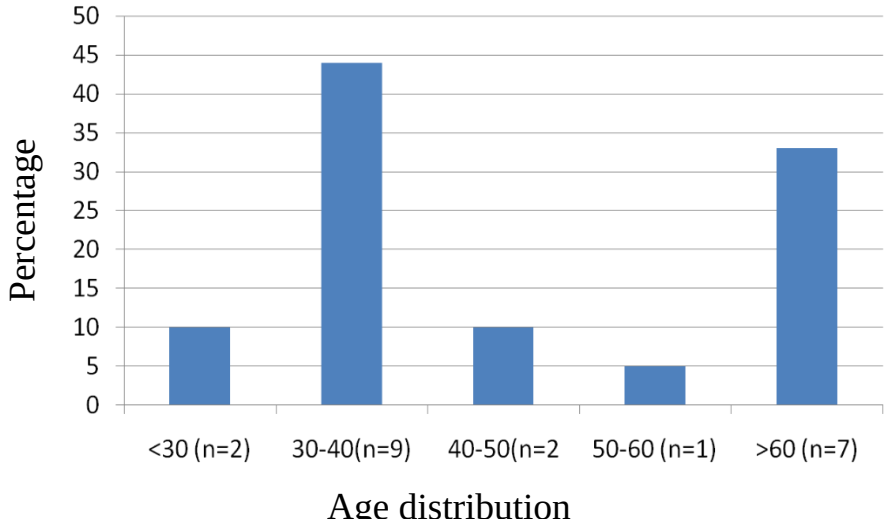

Figure 2: Hepatocellular carcinoma distribution by Age

Ultrasound patterns of the liver diseases: The ultrasound findings showed that 35(97%) participants had discrete lesions. Of those with discrete lesions, 28(80%) had lesions of more than 5cm in diameter. The number of lesions were grouped into either multiple or solitary. There were 19(54%) participants with multiple discrete lesions. The rest had solitary discrete lesions.

Table 1

Ultrasound findings for discrete lesions

Variable	Sample size	Levels	Overall n(%)	HCC n(%)	Metastasis n(%)	P
			n=35	**n=21**	**n=10**	
Size	35	≤5cm	7(20%)	2(10%)	5(50%)	0.026[f]
		>5cm	28(80%)	18(90%)	5(50%)	
Number of lesions	35	Multiple	19(54%)	11(55%)	6(60%)	0.554[f]
		Solitary	16(46%)	9(45%)	4(40%)	
Echogenecity	35	Heterogeneous	27(77%)	17(85%)	6(60%)	0.209[f]
		Hyperechoic	6(17%)	3(15%)	3(30%)	
		Hypoechoic	2(6%)	0	1(10%)	
Margins of the lesions	35	Circumscribed	17(48%)	8(40%)	6(60%)	0.307[f]
		Indistinct	7(20%)	5(25%)	1(10%)	
		Lobulated	10(29%)	7(35%)	2(20%)	
		Obscured	1(3%)	0	1(10%)	
Shape of the lesion	35	Irregular	12(34%)	7(35%)	3(30%)	0.229[f]
		Oval	4(11%)	1(5%)	3(30%)	
		Round	19(54%)	12(60%)	4(40%)	
Location of the lesion	35	Diffuse	14(40%)	7(35%)	5(10%)	0.386[f]
		Left lobe	9(26%)	7(35%)	1(10%)	
		Right lobe	12(34%)	6(30%)	4(40%)	

The test for association in Table 1 was Pearson's Chi Square test. We reported the Fisher's exact P value because in all the 2 by 2 tables created at least one cell had expected cell frequency that was less than 5. That is, the assumption for Chi Square test to hold was violated.

More than three quarters of the participants had heterogeneous discreet lesions. Margin of the lesions for 17(48%) participants was circumscribed, lobulated for 10(29%) participants, obscured for one participant and indistinct for 7(20%) participants. The shape of the lesion was round for majority of the participants, 19(54%). One quarter of the participants had the lesion located in the left lobe, 14(40%) had diffuse location while 12(34%) were located on the right lobe.

When the analysis was restricted to HCC, and separately to metastasis, the results were as shown in columns 5 and 6

of Table 1. The results show that majority of the HCC lesions were more likely to be > 5cm compared to metastasis, 18(90%) vs. 5(50%), P=0.026. The rest of the comparisons were not statistically significant. However, we can see that the chance of getting multiple lesions was high with metastasis compared to HCC, 6(60%) vs. 11(55%). HCC lesions had a higher chance of being heterogeneous compared to metastasis, 17(85%) vs. 6(60%). Majority of the metastasis had circumscribed margins compared to the HCC lesions, 6(60%) vs. 8(40%). There were more lobulated margins among the HCC lesions compared to the metastasis, 7(35%) vs. 3(30%). Majority of the HCC lesions were round in shape compared to the metastasis, 12(60%) vs. 4(40%). Most metastasis were located to the right compared to the HCC that were multifocal, and equally distributed to the left and right (Table 1).

Only one participant had diffuse involvement of the entire liver with no distinct lesions. The sonographic findings showed that it was HCC. The histological findings were non-specific in 1(3%) participant. Thirty-four, 97%, yielded positive findings. The histological findings were as shown in Figure 3.

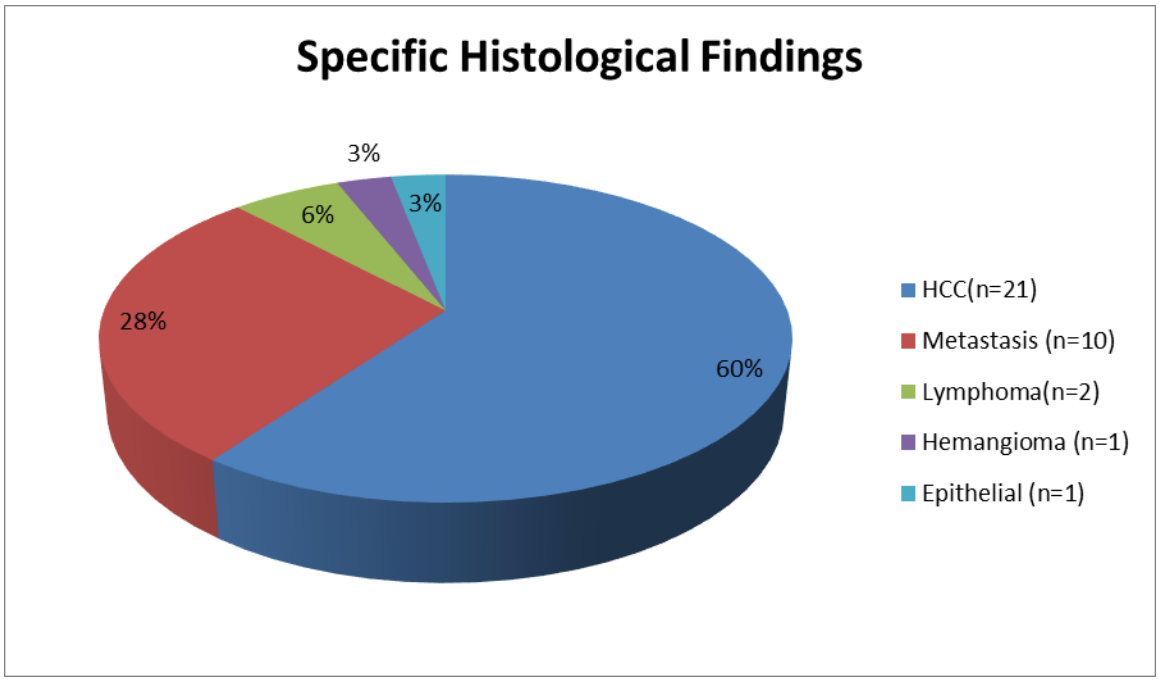

Figure 3: Specific Histological Findings

Figure 4: An ultrasound image of a 37-year-old female with multifocal hyperechoic liver lesions with degenerative changes. Histology confirmed it as HCC

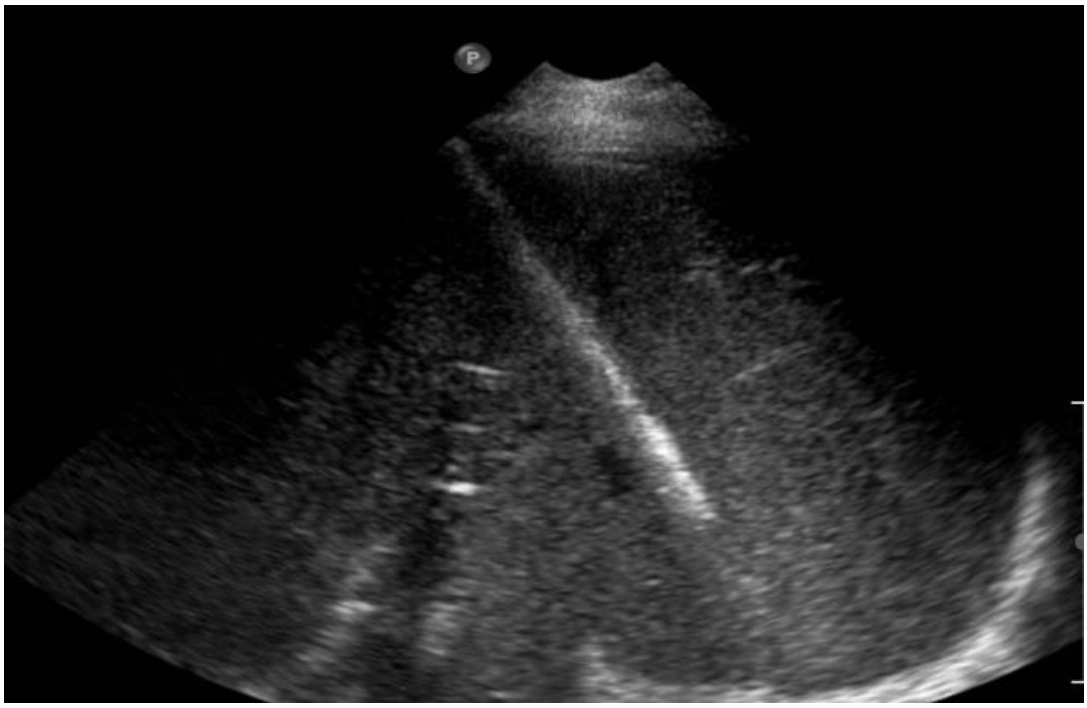

Figure 5: Biopsy gun tract during biopsy of diffuse liver lesion Histological diagnosis was Hepatocellular Carcinoma

DISCUSSION

Demographic characteristics of liver diseases: Liver cancer prevalence varies by gender and most common among men (11). However, in this study majority were female. More than half of the participants were aged above 40 years with those aged above 60 years contributing the greatest proportion in this group.

This study found that hepatocellular carcinoma is the most commonly diagnosed type of liver cancer, followed by metastasis. The age distribution of patients with HCC showed two peaks. This findings are consistent with data from other studies. Among the Caucasians, the incidence is two & a half times more common in men with a peak in the 6^{th} & 7^{th} decades of life. A study in rural South Africa by Kew M.C, found HCC incidence in the black population to peak in the third, fourth & fifth decade whereas in the South African whites the peak was in the sixth, seventh & eight decades (15).

This study found that hepatocellular carcinoma is the most commonly diagnosed type of liver cancer, followed by metastasis. This could be attributed to high levels of aflatoxin due to poor grain storage in Kenya as described by Mwangi et al (13) . There is also increased prevalence of hepatitis B and C virus, which is prevalent in Sub-Sahara Africa and Asia. Karoney et al, in their review of HCV prevelance in Africa, concluded that there is a high prevalence at 5.3% (14). In this study, 7% of the participants had hepatitis B virus. According to WHO data there is an elevated prevalence of chronic hepatitis B virus (HBV) infection in Sub-saharan Africa, with over 8% of the populations in these regions chronically infected with the virus (14).

Ultrasound patterns of the liver diseases: Majority of the participants had discreet lesions of more than 5cm in size. A significant number of participants presented with multiple discreet lesions. The majority of the HCC lesions were more likely to be larger than 5cm compared to metastasis. However, the chance of getting multiple lesions was high when the lesion was metastasis compared to HCC. This is a common finding in metastasis.

The major sono-morphologic pattern of hepatocellular carcinomas is heterogenous among patients seen at MTRH. HCC lesions had a higher chance of being heterogeneous compared to metastasis. This study found low frequency of hypoechoic features among the hepatocellular carcinomas or the hyperechoic pattern. A study by Chamadol revealed that the heterogenous nodules were more common among nodules over 3cm while the hypoechoic nodules were more prevalent among the small nodules less than 3cm (16). Livraghi et al had similar findings, which found high frequency of hypoechoic features among the hepatocellular carcinoma less than 4.5cm in size (17).

Majority of the metastasis had circumscribed margins compared to the HCC lesions. There were more lobulated margins among the HCC lesions compared to the metastasis. N'Gbesso et al that found the HCC tumor forms were mostly nodular and multiple (18).

Most patients with liver lesions had multiple number of discreet lesions. The margin of the lesions was mostly circumscribed. Very few lesions had

obscured margins. In this study population, the margins of lesions were fairly distributed among the major types. Regarding the distribution of lesions within the liver, they were no statistically significant preference for any certain section of the liver.

CONCLUSION

Hepatocellular carcinoma is the most commonly diagnosed liver pathology at Moi Teaching & Referral Hospital, Kenya. The major sonographic pattern seen in hepatocellular carcinoma is heterogeneous, with lesion size of more than 5cm diameter with circumscribed margins.

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