



Hepatomegaly with Steatosis Affects the Normal Liver Physiology of Young Adults in Port-Harcourt Metropolis: A Sonographic Assessment

R. Z. Nbeta^{1*} and L. K. David²

¹*Department of Medical Imaging Technology, Rivers State College of Health Science and Management Technology, Rumueme, Port-Harcourt, Rivers State, Nigeria.*

²*Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port-Harcourt, Choba, Rivers State, Nigeria.*

Authors' contributions

This work was carried out in collaboration between both authors. Author RZN proposed the topic and wrote the manuscript of the research as well did some of the ultrasound scan and reports of the patients used for the study. Author LKD carried out the editing and arrangement of the research. Both authors contributed in the analysis and discussion of findings in the research.

Article Information

Editor(s):

(1) Dr. Arulsevan Palanisamy, Muthayammal Centre for Advanced Research (MCAR), Muthayammal College of Arts and Science, India.

Reviewers:

(1) Serdar Olt, Adiyaman University, Turkey.

(2) Ujase Bin Farooq, Hawassa University, Ethiopia and Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, India.

(3) Majid Mohammed Mahmood, Mustansiriyah University, Iraq.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/61632>

Original Research Article

Received 10 August 2020

Accepted 14 October 2020

Published 09 June 2021

ABSTRACT

The liver is a major organ and plays a vital role in general physiology of human. Its pathology and abnormality will affect the normal wellbeing of human. This study was designed to determine the factors affecting liver size in adults of 18-50yrs from 2008-2012 in selected hospitals in Port Harcourt metropolis. Four hundred (400) sonograms and reports of patients (244 males and 156 females) scanned and diagnosed of liver diseases were used for this study. Results obtained shows that hepatomegaly with steatosis is the most common pathological conditions of the liver followed by hepatitis with 150 (37.5%) and 90 (22.5%) respectively. Also, from the yearly analysis, 2009 recorded the highest number of patients diagnosed of liver pathologies followed by 2012 with 99(24.5%) and 90(22.5%) respectively. From our findings, hepatomegaly with steatosis is the major

*Corresponding author: E-mail: zoraphdegreat@gmail.com;

pathology that affect the liver size in young adults in Port Harcourt, Rivers State, Nigeria. We also conclude that more alcohol consumption among young adults may trigger this effect on the liver which in turn can hinder the normal functions and can lead to deaths.

Keywords: Ultrasound; liver; hepatomegaly; steatosis; pathology; Port Harcourt.

1. INTRODUCTION

Hepatomegaly is frequent clinical finding in both children and adult, and may be caused by intrinsic liver disease or systemic alterations. In case of clinical suspicion, ultrasonography is generally the method of choice for starting diagnostic investigation in both adults and children [1-3]. The liver is the largest organ in the human body and during development, its size increases with increasing age, averaging about 5 cm spans at 5 years and attained adult size by age 15 years averaging about 1.2 cm to 1.5 cm. The measurement of liver size depends on some factors which includes; height and weight, gender, body habitus and body surface [4-7].

The liver which is located at the right upper quadrant of the abdomen is a vital and very essential organ of every vertebrates including humans [8-11]. It has a wide range of functions some of which are protein synthesis and the production of biochemicals enzymes necessary for digestion and detoxification of various metabolic in the body system. According to Francaviell et al., (1987), There is currently no way to compensate for the absence of liver function in the long term, although liver dialysis techniques can be used in the short term [12,13].

The present study is aimed at determining the factors affecting liver size in adults within the range of 18-50yrs. We also determine the gender that is prone to liver diseases between male and female, to establish the most common pathology that affects the liver in healthy adults within the study area. In a previous study (Sao et al., 2009), standardized an easy and reproducible ultrasonographic biometry method for utilization in the pediatric age range based on the measurement of hepatic length in longitudinal planes [14-17]. The singular aspect of such techniques lies in the preposition of intrahepatic anatomical repairs in associations with external orientation lines and the introduction of new parameter for measurement of the right hepatic lobe, resulting in the higher accuracy in the definition of sections planes and the measurement themselves [18].

2. MATERIALS AND METHODS

Sonograms and abdominal ultrasound reports of adults were sourced and carefully selected. A 3D SIEMEN SONOLINE PRIMA ultrasound machine was used. Two sonologist with five years sonographic and practical experience in diagnostic radiography and medical imaging sciences. The liver size of 1.60cm and above in longitudinal span were considered enlarged (hepatomegaly). The assessment of liver echogenicity in comparison with the renal cortex (sonographic hepatorenal index – SHRI) were also observed. The following points were put into considerations as sonographic features of hepatic steatosis. Enhanced hepatic parenchymal echogenicity (mild steatosis), increased parenchymal echogenicity, disturbed visibility of vascular structures in the liver and diaphragm (medium steatosis), increased parenchymal echogenicity, poor visibility of vascular structures in the liver and diaphragm, poor visibility of the posterior segment of the liver (severe steatosis). The performance of radiographer and medical imaging technologist in diagnosing hepatic abnormality were also evaluated. The results and data collected were presented using tables and percentage. This method was self-developed. The clinical history of the individuals (patient) were also consider. There is was no comparison between the findings with laboratory investigations. Ultrasound was preferable since its non-invasive, cost-effective and always available.

3. RESULTS

Table 1 describes the age of adult patients and their pathologies. It reveals that out of the fifty-eight (58) patients examined, 26(45%) has hepatomegaly with steatosis, while liver cancer and liver cirrhosis are both 9(15.5%) and hepatitis was 14(24%) patients.

Table 2 shows that 28(28.2%) patients has hepatitis, 31(31.3%) patients has hepatomegaly with steatosis while 25(25.2%) patients has liver cancer and 15(15.0%) patients has liver cirrhosis out of the total number of ninety-nine (99) patients examined for the year.

Table 3 shows that out of eighty-two (82) patients diagnosed, 18 (22%) has hepatitis's 27 (33%) has hepatomegaly with steatosis, 18 (22%) has liver cancer and 19 (23%) suffer liver cirrhosis in the year 2010.

Table 4 shows that, 13 (18%) patients was diagnosed of hepatitis out of the total number of seventy-one (71) patients, 33 (46%) has hepatomegaly with steatosis, 16 (23%) has liver cancer and 9 (13%) has liver cirrhosis for the year 2011.

Table 5 also shows that 17 (19%) patients was diagnosed of hepatitis, 33 (37%) was hepatomegaly with steatosis, 17 (19%) was liver cancer and 23 (25%) was liver cirrhosis, out of the total number of ninety (90) patients diagnosed for the year 2012.

Table 6 summarized the results from 2008-2012, out of the total samples of four hundred (400) patients, diagnosed, 90 (22.5%) was hepatitis, 150 (37.5%) was hepatomegaly with steatosis, 85 (21.2%) was liver cancer and 75 (18.8%) was liver cirrhosis. The results reveal that, in 2008, 58(14.5%) patients was diagnosed, 2009, 99(24.8%), 2010, 82 (20.5%) 2011, 71(17.8%) and 2012, 90(22.5%).

From our findings, hepatomegaly with steatosis was the highest diagnosed pathology affecting the liver size in the study area. This is usually caused by much alcoholic consumption while liver cirrhosis has the lowest. The table also shows that 2009 recorded the highest number of patients diagnosed for the yearly analysis while 2008 was the lowest.

4. DISCUSSION

In Table 1, the age of patients and their pathologies were discussed for the year 2008. It reveals that out of the fifty-eight (58) patients examined, 26(45%) has hepatomegaly with steatosis, while liver cancer and liver cirrhosis are both 9(15.5%) and hepatitis was 14(24%) patients. Table 2 shows that 28(28.2%) patients has hepatitis, 31(31.3%) patients has hepatomegaly with steatosis while 25(25.2%) patients has liver cancer and 15(15.0%) patients has liver cirrhosis out of the total number of ninety-nine (99) patients examined for the year 2019.

The liver which is a vital organ that plays a major role in metabolism with numerous functions in the human body.

Table 1. Shows the age distribution of adults of 18-50 years with liver pathology for the year 2008

| Age-Group | Hepatitis | Hepatomegaly with Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-----------|-----------|-----------------------------|--------------|-----------------|-------|------------|
| 18-20 | 4 | 10 | 2 | 4 | 20 | 34% |
| 21-30 | 3 | 8 | 1 | 0 | 12 | 12% |
| 31-40 | 2 | 4 | 2 | 3 | 11 | 19% |
| 41-50 | 5 | 4 | 4 | 2 | 15 | 26% |
| Total | 14(24%) | 26(45%) | 9(15.5) | 9(15.5%) | 58 | 100% |

Table 2. Shows the age distribution of adults of 18-50 years with liver pathology for the year 2009

| Age-Group | Hepatitis | Hepatomegaly With Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-----------|-----------|-----------------------------|--------------|-----------------|-------|------------|
| 18-20 | 8 | 5 | 13 | 2 | 28 | 29% |
| 21-30 | 7 | 10 | 5 | 4 | 26 | 26% |
| 31-40 | 10 | 6 | 4 | 6 | 26 | 26% |
| 41-50 | 3 | 10 | 3 | 3 | 19 | 19% |
| Total | 28(28.2%) | 31(31.3%) | 25(25.2%) | 15(15.0%) | 99 | 100% |

Table 3. Shows the age distribution of adults 18-50 years with liver pathology for the year 2010

| Age-Group | Hepatitis | Hepatomegaly With Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-----------|-----------|-----------------------------|--------------|-----------------|-------|------------|
| 18-20 | 10 | 13 | 3 | 8 | 24 | 41% |
| 21-30 | 0 | 3 | 5 | 4 | 12 | 15% |
| 31-40 | 0 | 9 | 8 | 3 | 20 | 24% |
| 41-50 | 8 | 2 | 2 | 4 | 16 | 20% |
| Total | 18 (22%) | 27 (33%) | 18 (22%) | 19 (23%) | 82 | 100% |

Table 4. Shows the age distribution of adults of 18-50 yrs with liver pathology for the year 2011

| Age-Group | Hepatitis | Hepatomegaly With Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-----------|------------|-----------------------------|--------------|-----------------|-------|------------|
| 18-20 | 5 | 8 | 0 | 2 | 15 | 21% |
| 21-30 | 4 | 12 | 7 | 2 | 25 | 35% |
| 31-40 | 2 | 6 | 5 | 1 | 14 | 20% |
| 41-50 | 2 | 7 | 4 | 4 | 17 | 24% |
| Total | 13 (18. %) | 33 (46%) | 16 (23%) | 9 (13%) | 71 | 100% |

Table 5. Shows the age distribution of adults of 18-50 yrs with liver pathology for the year 2012

| Age-Group | Hepatitis | Hepatomegaly With Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-----------|-----------|-----------------------------|--------------|-----------------|-------|------------|
| 18-20 | 7 | 10 | 4 | 10 | 31 | 34% |
| 21-30 | 1 | 12 | 5 | 1 | 19 | 21% |
| 31-40 | 4 | 7 | 2 | 10 | 23 | 26% |
| 41-50 | 5 | 4 | 6 | 2 | 17 | 19% |
| Total | 17 (19%) | 33 (37%) | 17 (19%) | 23 (25%) | 90 | 100% |

Table 6. Shows the summary of patients diagnosis for each year and also their pathology

| Year | Hepatitis | Hepatomegaly With Steatosis | Liver Cancer | Liver Cirrhosis | Total | Percentage |
|-------|--------------|-----------------------------|--------------|-----------------|-------|------------|
| 2008 | 14 | 26 | 9 | 9 | 58 | 14.5% |
| 2009 | 28 | 31 | 25 | 15 | 99 | 24.8% |
| 2010 | 18 | 27 | 18 | 19 | 82 | 20.5% |
| 2011 | 13 | 33 | 16 | 9 | 71 | 17.8% |
| 2012 | 17 | 33 | 17 | 23 | 90 | 22.5% |
| Total | (90 (22.5%)) | 150 (37.5%) | 85 (21.2%) | 75 (18.8%) | 400 | 100% |

Any pathological conditions can reduce or increased the shape, structures and size of the liver which can lead to death. By percussions, the mean liver was found to be 7 cm for women and 10.5 cm for men. A liver span of 2-3 cm larger or smaller that these values is considered abnormal. The liver also weighs 1200-1400 g in adult women and 1400-1500 g in adult men. Pathologically, hepatomegaly with steatosis was the highest case of liver disease representing 37.5% of the sample size. This could be caused by much alcohol consumption. Also, from the yearly analysis, 2019 recorded the highest number of patients diagnosed with abnormal liver size due to pathological conditions

with about 99 (24.8%) patients while 2008 has the lowest with about 58 (14.5%) patients. Ultrasound is more reliable and safer for determining liver size compared to computed tomography and magnetic resonance imaging due to its price affordability and non-use of ionizing radiation [19,20].

Hepatic steatosis can cause inflammatory changes on the liver which can damage and create scarring. In severe cases, this scarring can lead to liver failure. When the fatty liver develops in someone who drinks a lot of alcohol, it is known as alcoholic fatty liver disease (AFLD)

which affects up to about 25 to 30% of people in the United States and Europe.

According to Marus George et al. (2012), the grading of hepatomegaly from autonomic volumetric liver assessment normalized by body-surface-area which matches well with clinical interpretations for hepatomegaly and steatosis and may improve its detection compared with height measurements. It further stated that alcohol contributes up to about 25% of hepatic steatosis.

Another common cause of liver steatosis is alcoholic liver disease (ALD) which is suspected in individuals who consume more than 20-30g of ethanol daily (respectively for women and men). Less commonly, liver steatosis can be caused by drugs (steroids, methotrexate), improper nutrition (malnutrition, rapid weight loss) and other factors (HCV infection, parental nutrition), Sekiyama et al [21]. In comparison, the above findings agreed with the current study that hepatomegaly and steatosis affect the normal liver size and its physiology.

5. CONCLUSION

Based on our findings, ultrasound plays a vital role in examining liver diseases which affect its normal size. Men were also found to be more prone to liver disease than female. Hepatomegaly with steatosis is the major pathology that affect the liver size in young adults in Port Harcourt, Rivers State, Nigeria. We also conclude that more alcohol consumption among young adults be minimized as this affects the liver which on turns hinder the normal its functions and can lead to deaths.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Fischar U, Johnson PJ. Ultrasound determination of liver size and assessment of patient with malignant liver disease. *Journal of American institute of ultrasound in medicine.* 1963;12.
2. Francavilla A, Ove PE, Polimeno RT. A handbook on liver cancer. (PubMed). 1999;67-73.
3. Gosink BB, Laymaster CE. Ultrasonic determination of hepatomegaly. *Clinical Journal of Ultrasound.* 2005;90-109.
4. Hector T, Leotta DF, Belton SD. Estimation of the human liver volume and configuration using three-dimensional ultrasonography; effect of a high caloric liquid meal. (PubMed). 2011;122-130.
5. Henderson JM, Heymsified SB, Horowitz SD. Measurement of liver and spleen volume by computed tomography. *Radiol.* 1994;14:525-27.
6. Kim DH, Richard PJ. Diagnostic imaging procedures in gastroenterology. 2011;23-45.
7. Monika SO, Oconnor VA. Gender difference in alcohol metabolism; relationship to liver volume and effect of adjusting for body mass. (PubMed). 2012;115:1552-1557.
8. Abbih PL. Ultrasonography update on liver technique. *Radiol Journal.* 1998;36-299-309.
9. Anderson V, Sonne J, Setting S, Prip A. The volume of liver in patients' correlations with body weight and alcohol consumption. *PubMed (google scholar).* 2000;35(5):12-23.
10. Albrecht T, Hohmann J, Oldenburg A. Detection and characterization of liver metastasis. *Euro Radiol.* 2004;25-30.
11. Borner n, Schwerk WB, Brown B, Lebber ST. Ultrasound diagnosis of the liver. Landsberg Germany. *Radiopaedia.* 1995;23-26.
12. Delp MH, Manny RT. Majors of physical liver diagnosis. *Elsevier journal of ultrasound.* 2002;29-45.
13. Francavilla A, Dileo GS, Eagon PK. *Gastroenterology.* 86:552(pmc free articles). *World journal of gastroenterology.* 1984;87-110.
14. Bucher NL, Patel U, Cohen S. Foundation symposium no.55. Hepatrophic factors. 2008;95.

15. Castell DO, Frank BB. Abdominal examination: Role of percussion and auscultation. Postgraduate med. 1977;62(6):133.
16. Cosgrove, Meire HB. Ultrasound general principles (diagnostic radiology): A textbook of medical imaging. Journal of Ultrasound. 2008;146-148.
17. Dawson D. Measuring alcoholic consumption: Limitations and prospects for improvement. 1998;93:963-968.
18. George MS, Nahas Z, Molloy M, Speer AM, Oliver NC, Li XB, Arana GW, Risch SC, Ballenger JC. A controlled trial of daily left prefrontal cortex TMS for treating depression. Biological psychiatry. 2000;48(10):962-70.
19. Megresmis WK, Vlachonikolis GI, Tsilimigaki AM. Liver length in adult with ultrasound; normal values based on sex, age and somatometric parameters. Radiol. 2004;331(1):129-134.
20. Netter FH. Digestive system. Part iii: Liver, biliary tract and pancreas. The ciba collection of medical illustration. Radiol Pub. 1964;211-230.
21. Sekiyama K, Anderson GT, Harry AS. A prognostic value of hepatic volumetry in fulminant hepatic failure. 1994;39(2):240-4.

© 2021 Nbete and David; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/61632>