The Relationship between Alkaline phosphates level, liver diseases and gallstone

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Abstract

Alkaline phosphatase is an enzyme produced primarily by the liver. Tests for alkaline phosphatase can be part of routine lab work or part of a series of tests called a liver panel, which includes tests for other liver enzymes, such as aspartate aminotransferase, or alanine aminotransferase. This study aims to find out the effect of alkaline phosphatase enzyme on liver diseases and gallstones. Alkaline phosphatase level was measured for fifty patients suffering from gallstone (30 patients), obstructive disease (10 patients) and liver cirrhosis (10 patients). All patients grouped according to the ages (Each five years as a group), all female patients grouped according to number of pregnancy. The data in this study showed that there is a difference between males and females in terms of age in diseases (gallstones, biliary obstruction and liver diseases) depending on the results of measuring Alkaline phosphatase, where it appeared that the highest results of this enzyme for males with gallstones in the age group (36-45 years) with a concentration of (192.75 IU/L), while for females with gallstones is in the age group (46-55 years) with a concentration of (264 IU/L), as for biliary obstruction, it was in the same age group for both gender (46-55) years, with a concentration of (203.5 IU/L and 345 IU/L) for males and females respectively). As for liver diseases, the age group for males was more than 55 years, and females for the age group (45-55) years (170.33 IU/L and 165 IU/L), respectively. The data also showed the female group with more than 7 time of pregnancy with high concentration of ALP.

Keywords: Alkaline phosphatase, liver diseases.

العلاقة بين مستوى الفوسفاتيز القلوي وأمراض الكبد وحصى المرارة

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الخلاصة

العمل من جزءًا القلوية الفوسفاتيز اختبارات تكون أن يمكن .أساسي بشكل الكبد ينتجه إنزيم هو القلوي **الخلاصة** الفوسفاتيز مثل ، الكبد الأخرى إنزيمات اختبارات تتضمن والتي ، الكبد لائحة تسمى الاختبارات من سلسلة من ا جزءً أو الروتيني المخبري .أمينوترانسفيراز ألانين أو ، أمينوترانسفيراز أسبارتات

P-ISSN: 2664-0562
E-ISSN:2664-0554

تهدف هذه الدراسة إلى ايجاد تأثير انزيم الفوسفاتيز القاعدي على امراض الكبد وحصوة المرارة. تم قياس مستويات الفوسفاتيز القاعدي لخمسين مريض يعانون من أمراض والمرارة (30 مريض يعانون من حصوة المرارة) و (10 مرضى يعانون من انسداد قنوات الصفراء) و(10 مرضى يعانون من تشمع الكبد) .تم تقسيم جميع المرضى إلى مجموعات على أساس العمر (كل خمس سنوات مجموعة عمرية) , والمرضى الإناث قسمت على أساس عدد مرات الحمل من جهة أخرى .

أظهرت البيانات في هذه الدراسة أن هناك فرقاً بين الذكور والإناث من حيث العمر في الأمراض (حصى المرارة ، انسداد القنوات الصفراوية وأمراض الكبد) اعتماداً على نتائج قياس الفوسفاتاز القلوي ، حيث ظهر أن أعلى نتائج لهذا الإنزيم بالنسبة الذكور الذين يعانون من حصوات المرارة في الفئة العمرية (36-45 سنة) بتركيز (192.75 وحدة دولية / لتر) ، بينما للإناث المصابات بحصوات المرارة في الفئة العمرية (46-55 سنة) بتركيز (264 وحدة دولية / لتر) أما انسداد القنوات الصفراوية فكان في نفس الفئة العمرية لكلا الجنسين (46-55) سنة بتركيز (203.5 وحدة دولية / لتر و 345 وحدة دولية / لتر) للذكور والإناث على التوالي). أما بالنسبة لأمراض الكبد ، فكانت الفئة العمرية للذكور أكثر من 55 سنة ، والإناث للفئة العمرية (45-55) سنة (170.33 وحدة دولية / لتر و 165 وحدة دولية / لتر) على التوالي. أظهرت البيانات ايضا إن أعلى تركيز للفوسفتيز القاعدي لمجموعة الإناث اللواتي لديهن 7 مرات حمل وأكثر.

الكلمات المفتاحية *: الفوسفاتيز القلوي ، انزيمات الكبد ، امراض الكبد .*

Introduction

One of the great significance or value organs of the body is the liver, the level of the main chemicals in the body, especially the blood, is regulated in the liver, and with the support of the kidneys, to clean the body of toxins and waste. [1,2].

Alkaline phosphatase is an enzyme produced primarily by the liver. Tests for alkaline phosphatase can be part of routine lab work or part of a series of tests called a liver panel [3], which includes tests for other liver enzymes, such as alanine aminotransferase, or aspartate aminotransferase. Alkaline phosphatase is produced infrequently in the kidney and therefore renal failure is not related to this enzyme, [4,5].

Some liver diseases are caused by factors that damage the liver or are caused by genetic factors, such as alcohol use and viruses. Among the causes of liver damage, there is a link with obesity, which leads to scarring or liver fibrosis, which is a life-threatening condition. [6-8].

The parasitic and viral infections of the liver cause inflammation and obstruction of the liver's functions, and the most common types of these infections are viral hepatitis of all types:

- Hepatitis A
- Hepatitis B
- Hepatitis C

Autoimmune diseases that attack the body's immune system in certain parts of it, affecting in one way or another on the liver and liver functions. These diseases include:

- Autoimmune hepatitis

P-ISSN: 2664-0562
E-ISSN:2664-0554

- Primary biliary cirrhosis
- Primary sclerosing cholangitis

Genetic diseases that come due to a genetically abnormal gene from one or both parents that causes damage to the liver as a result of the accumulation of various substances like immune complexes in the liver that lead to damage and obstruction of liver functions. These diseases include:

Cirrhosis: One of the cases in which the liver deteriorates slowly is cirrhosis of the liver and begins to be unable to perform its function normally and completely due to the long period of injury and the normal tissue of the liver turns into scar tissue and gradually prevents blood flow in the liver tissue and leads to its uselessness. [9]

High ALP: An alkaline phosphatase level that exceeds the reference level can lead to pathological medical conditions or syndromes such as mental retardation syndrome and hyperphosphatemia. [10]

Gallstone: The gallbladder as an organ is a small, pear-shaped located below the liver in the upper right of the abdomen in the area between the chest and hips, the stones of the gallbladder (Gallstones) are hard particles that grow and precipitate in the gallbladder.

The size of gallstones can range from a tiny grain of sand and bigger to a golf ball. The gallbladder can grow a single big gallstone, hundreds of small stones, or both small and large stones. Gallstones can cause sudden pain in the upper right abdomen [11] This pain, called biliary colic or a gallbladder attack, it often occurs when gallstones block the bile ducts in the liver [12].

Aim of study

This study designed to identify the relationship between the changes of alkaline phosphatase level in the liver diseases and gallstones.

Material and method

This study was done in Al-Ba'aquba hospital during the period from 1/2021 to 5/2021.

Fifty cases was collected, 30 patients suffering from gallstone and 10 patients suffering from obstructive disease and 10 patients suffering from liver cirrhosis, their age range from 25 years to 75 years.

Venous blood sample (5mL) was collected from each patients and tested for ALP by kinetic determination test.

Principle

Colorimetric determination of alkaline phosphatase activity was applied according to the following reaction:

Alkaline phosphatase

P-ISSN: 2664-0562
E-ISSN:2664-0554

Phenylphosphate ⟶ phenol + phosphates

PH 10

The liberated phenol is measured in the presence of 4-aminoantipyrine and potassium ferric cyanide . The presence of sodium arsenate in the reagent stops the enzymatic reaction.

Normal values of ALP: For Male and female (44-147 IU/L)

Procedure:

This test was carried out according to the manufacturer's company; Bio Merieoux / France.

Results

Table (1): ALP Conc. among male groups with gallstone disease.

Age groups	ALP Conc. (IU/L)
25-35	120
36-45	192.75
46-55	134.66
>56	128.33

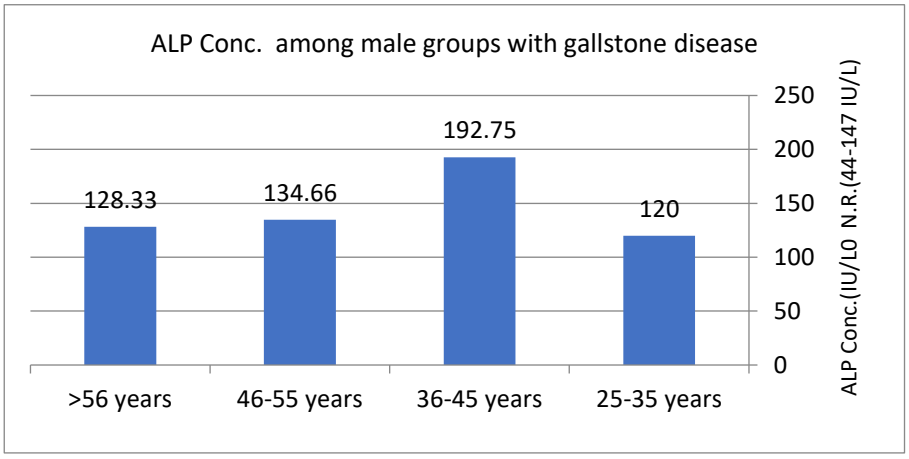

Fig. (1): ALP Conc. among male groups with gallstone disease.

Table (2): ALP Con. among female groups with gallstone disease.

Age groups	ALP Conc. (IU/L)
25-35	116.5
36-45	98.75
46-55	264
>56	140.33

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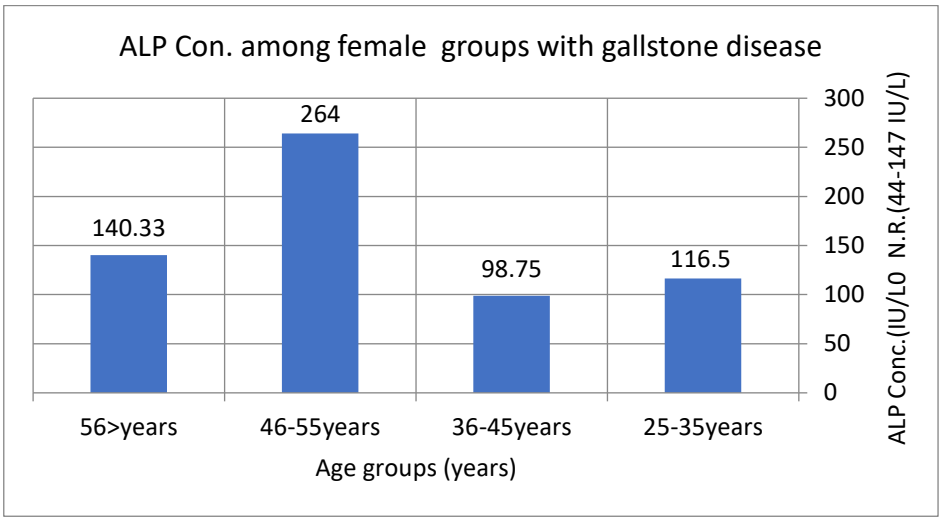

Fig. (2): ALP Con. among female groups with gallstone disease.

Table (3): ALP Conc. among patients with gallstone.

Age groups	Male ALP Conc. (IU/L)	Female ALP Conc. (IU/L)
25-35	120	116.5
36-45	192.75	98.75
46-55	134.66	264
>56	128.33	140.33

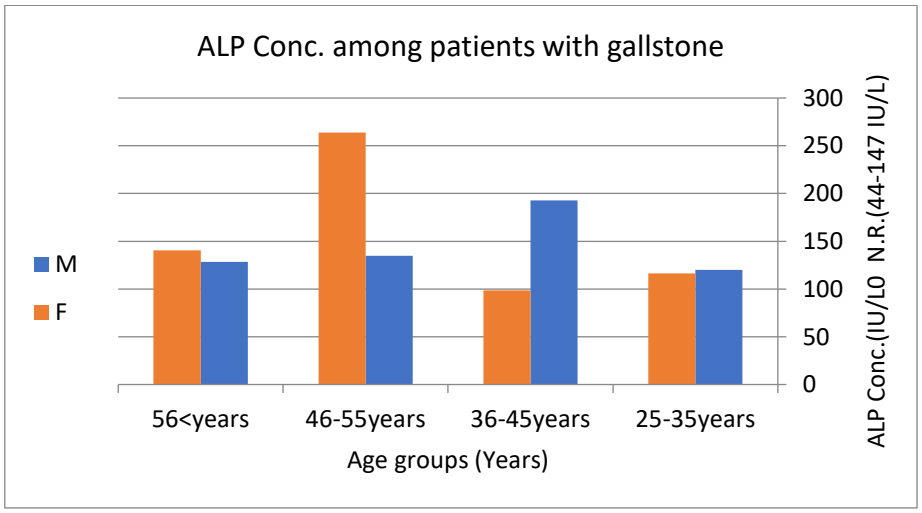

Fig. (3): ALP Conc. among patients with gallstone

Table (4): ALP Conc. among male groups with obstructive disease.

Age groups	Male ALP Conc. (IU/L)
46-55	203.5
>56	178

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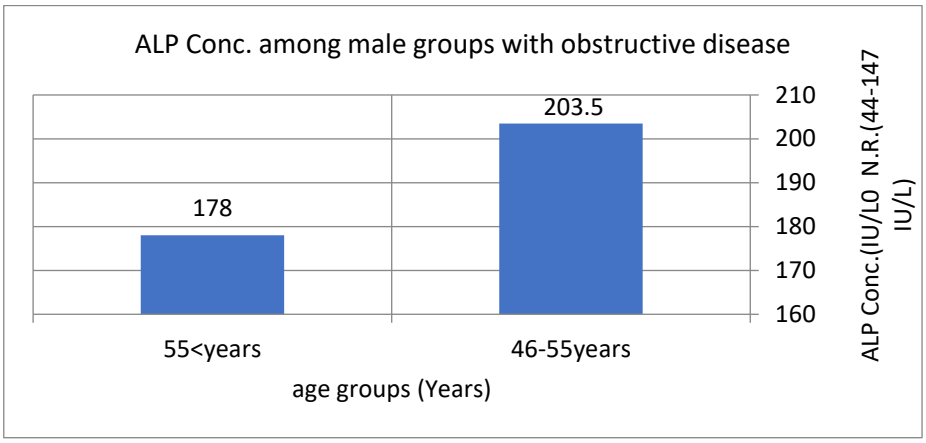

Fig. (4): ALP Conc. among male groups with obstructive disease.

Table (5): ALP Conc. among female with obstructive disease.

Age groups	Female ALP Conc. (IU/L)
36-45	321
46-55	345
> 56	287.5

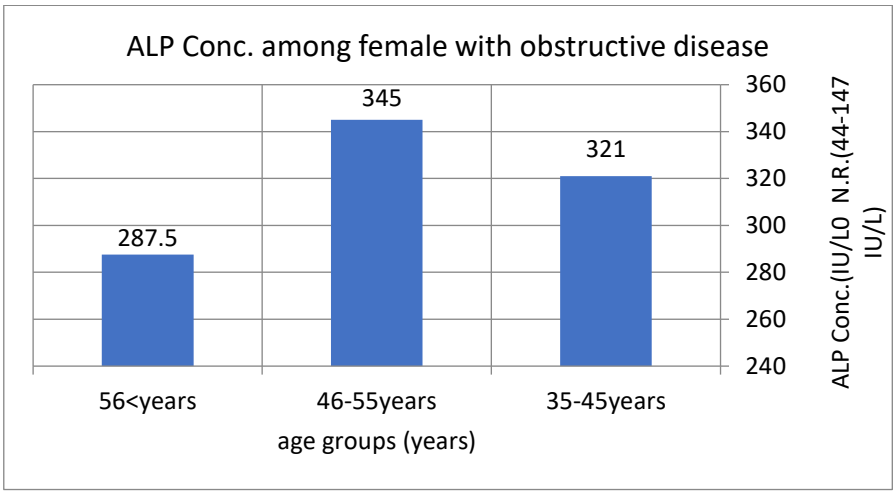

Fig. (5): ALP Conc. among female with obstructive disease.

Table (6): ALP Conc. among obstructive patients.

Age groups	Male ALP Conc. (IU/L)	Female ALP Conc. (IU/L)
35-45	-	321
46-55	203.5	345
>56	178	287.5

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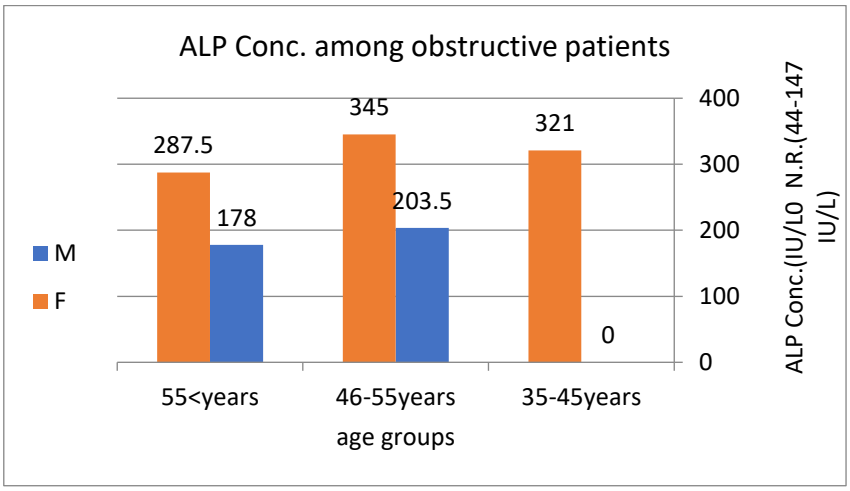

Fig. (6): ALP Conc. among obstructive patients.

Table (7): ALP Conc. among male age groups with liver disease.

Age groups	Male ALP Conc. (IU/L)
45-55	160.5
>56	170.33

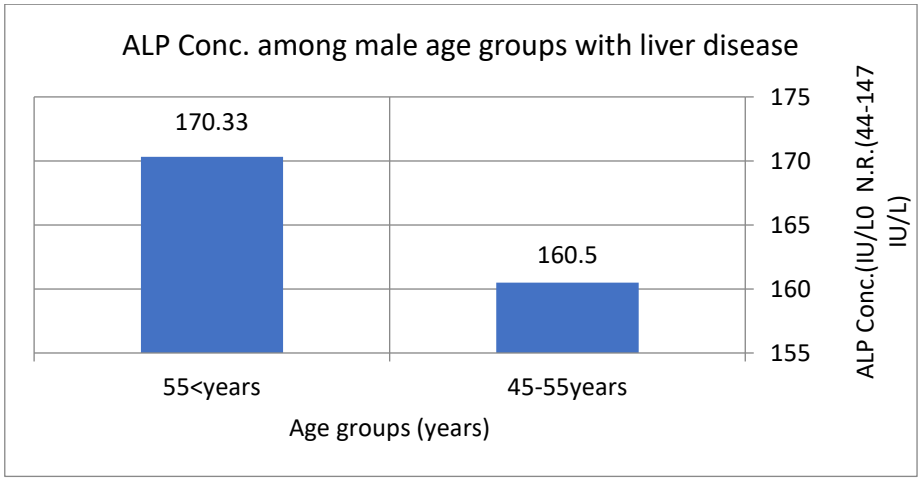

Fig. (7): ALP Conc. among male age groups with liver disease.

Table (8): ALP Conc. among female groups with liver disease.

Age groups	Female ALP Conc. (IU/L)
45-55	165
➢ **56**	142

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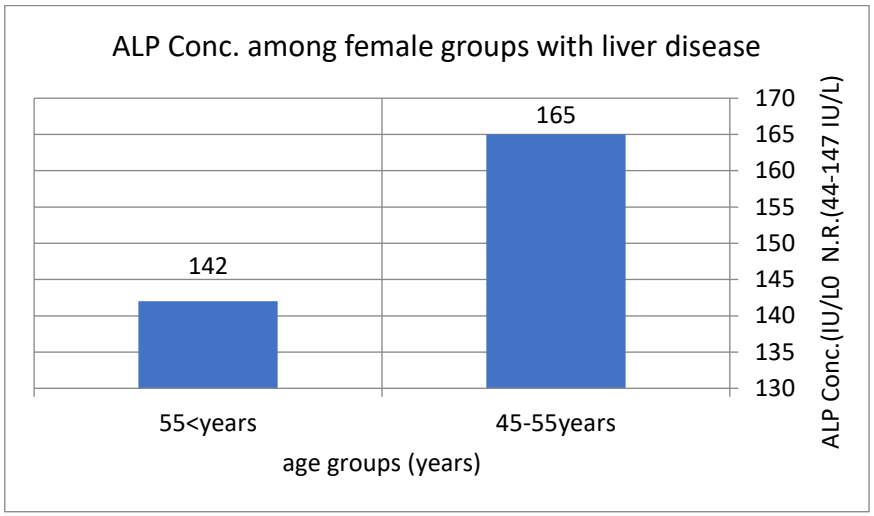

Fig. (8): ALP Conc. among female groups with liver disease.

Table (9): ALP Conc. among liver disease.

Age groups	Male ALP Conc. (IU/L)	Female ALP Conc. (IU/L)
46-55	160.5	170.33
> 56	165.45	142

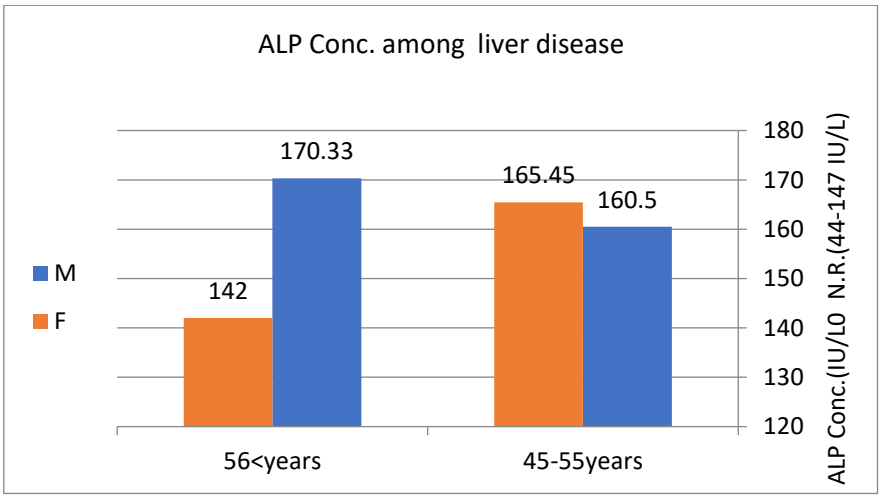

Fig. (9): ALP Conc. among liver disease.

Table (10): The relation between Numbers of pregnancy & ALP Conc**.** among female gallstone patients.

No. of pregnancy	Female ALP Conc. (IU/L)
1-3	97.66
4-6	110
>7	216.5

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E-ISSN:2664-0554

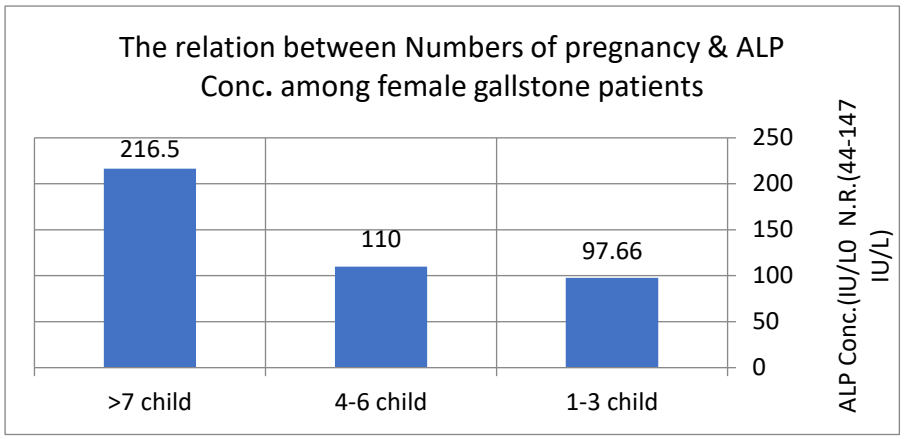

Fig. (10): The relation between Numbers of pregnancy & ALP Conc**.** among female gallstone patients.

Table (11): Relation between Alp conc. & number of pregnancy among obstructive patients.

No. of pregnancy	Female ALP Conc. (IU/L)
4-6	298.66
>7	333

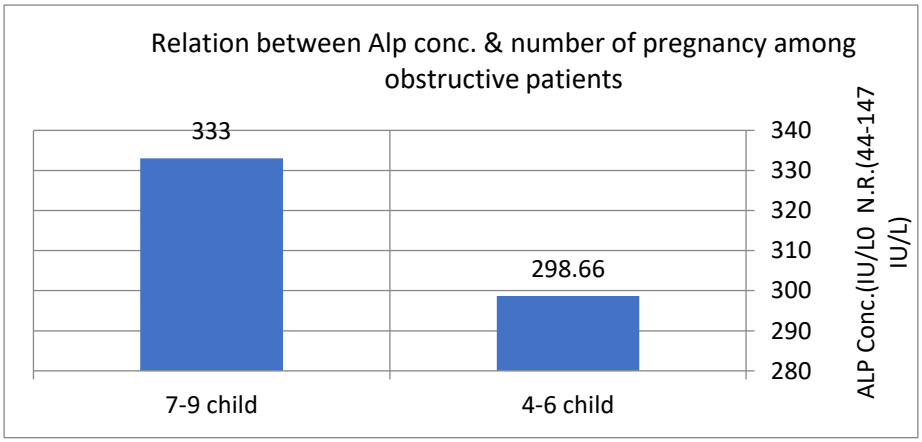

Fig. (11): Relation between Alp conc. & number of pregnancy among obstructive patients.

Table (12): The relation between ALP Conc. & the number of pregnancy among female patients with liver disease.

No. of pregnancy	Female ALP Conc. (IU/L)
4-6	153
>7	144

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E-ISSN:2664-0554

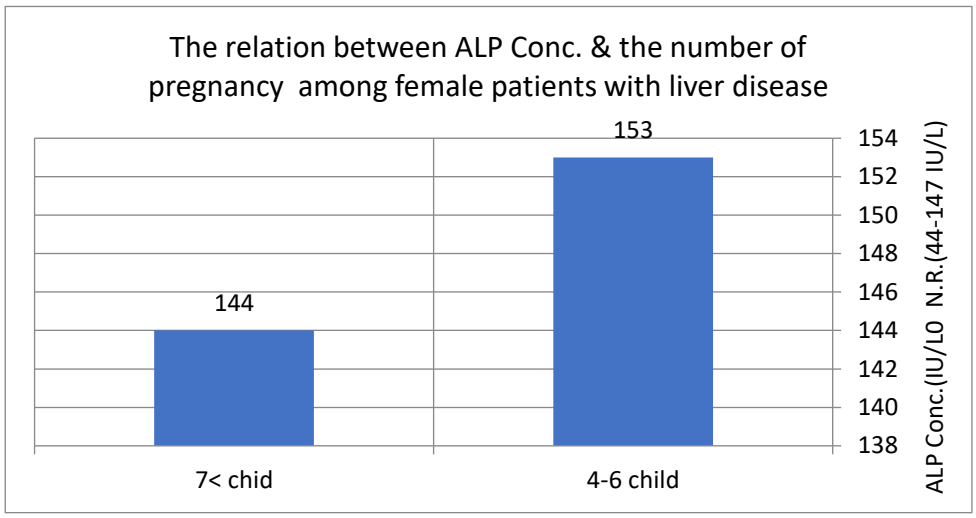

Fig. (12): The relation between ALP Conc. & the number of pregnancy among female patients with liver disease.

Discussion

The present study showed the highest concentration of ALP (192.75 IU/L) in male at age group (36-45 years), (Table and figure 1) while the female age group (46-55 years) showed highest concentration (264 IU/L), (Table and figure 2) in patients suffered from gallstone disease. With age, and more often in women, the risk of cholecystitis increases due to gallstones, and other factors such as obesity or rapid weight loss, as well as pregnancy, increase the incidence. [13 -15].

Table and figure (4) showed the highest concentration of ALP in male patients surfed from obstructive disease (203.5 IU/L) in age group (46-55 years) while table and figure (5) showed the highest concentration of ALP (345 IU/L) in female age group (46-55 years) the result is highest in comparison with male patients in same age group (table and figure 6).

Table and figure (7) showed highest concentration of ALP in male patients suffered from other liver diseases than gallstone and obstructive disease (170.33 IU/L) in age group (>55 years) while female patients showed (165 IU/L) in age group (46-55 years), table and figure (8). The male patients with liver disease were showed the highest concentration of ALP in comparison with female patients in same age group (>55years) table and figure (16,9).

The present study showed the relation between the number of pregnancy and the elevated of ALP in female patients suffered from different liver diseases in which the highest ALP concentration was showed in patients suffered from gallstone and obstructive diseases with more than 7 time of pregnancy (216.5 IU/L and 333 IU/L respectively) (table and figure 10 and 11). While table and

P-ISSN: 2664-0562
E-ISSN:2664-0554

figure (12) showed the highest concentration in female patients suffered from liver disease with (4-6) time of pregnancy (153 IU/L).

Conclusion

1- Old ages are more susceptible to liver diseases and gallstone.
2- ALP elevated with the all liver diseases.
3- ALP was increased with increase of the number of pregnancy.

P-ISSN: 2664-0562
E-ISSN:2664-0554

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P-ISSN: 2664-0562

E-ISSN:2664-0554