

Comparative Study of the Serum Bilirubin and Various Other Liver Related Enzymes in Different Types of Jaundice

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Received: June 2018

Accepted: June 2018

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ABSTRACT

Background: This study was designed to compare the study of serum bilirubin and various other Liver related enzymes in different types of Jaundice in patients attending the Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha. **Methods:** The study includes total 50 subjects, out of which 20 were controls and 30 were Jaundice cases. Thirty jaundice cases were divided into 10(Pre-Hepatic), 10(Hepatic) & 10(Post-Hepatic) jaundice patients according to inclusion-exclusion criteria. **Results:** The results of our study show that the levels of Total Bilirubin, Direct Bilirubin & Indirect bilirubin were significantly raised in the Jaundice patients than that of control. This study was found that the other liver enzyme i.e. SGOT, SGPT & ALP were found to be increased than the control. **Conclusion:** In conclusion, the high serum bilirubin level is a marker of Jaundice. Increased direct bilirubin and alkaline phosphatase (ALP) specifically points towards obstructive Jaundice, Increased indirect bilirubin level points towards pre-hepatic (Hemolytic) jaundice whereas increased bilirubin (Direct & Indirect) along with SGOT & SGPT levels points towards hepatic jaundice.

Keywords: Jaundice; Pre-hepatic, Hepatic and Post-hepatic.

INTRODUCTION

Jaundice may be defined as yellowish discoloration of the skin, mucous membrane & sclera of eye due to presence of excess amount of bilirubin in blood.^[1] It is not a disease but is a symptom of an elevated bilirubin level in blood. Jaundice is not painful, but serious complications can occur if the elevated level of bilirubin is not treated in a timely manner. Increased levels of bilirubin in blood more than the normal level is known as Hyperbilirubinemia. Severe hyperbilirubinemia can be toxic to the nervous system, potentially leading to brain damage.

Epidemiology

- The prevalence of jaundice may vary with age and sex; newborns and older adults are mostly affected.

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- The causes of jaundice may also vary with age. Approximately 20% of term newborns in the first

week of their life develop jaundice, mainly due to immaturity of the hepatic conjugation process.

- In infancy or childhood, congenital abnormalities, haemolytic or bilirubin uptake disorders and conjugation defects are also responsible for jaundice. Among school age children, viral hepatitis A is the most frequent cause of jaundice. Common duct stones, alcoholic liver disease and neoplastic jaundice usually occur in middle-aged and older patients
- In men, Jaundice is most likely to be due to cirrhosis, chronic hepatitis B, hepatoma, pancreatic cancer or sclerosing cholangitis. In women in contrast to men, they tend to have higher rates of common duct stones, primary biliary cirrhosis and carcinoma of the gallbladder.^[2]

Causes:

- Increased production of bile pigment in the normal liver that it can excrete or the failure of a damaged liver to excrete the bilirubin produced in normal amounts.
- Obstruction of the excretory ducts of liver leads to prevention of the excretion of bilirubin.^[1]

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Classification

Jaundice can be classified into three categories, depending on which part of the physiological mechanism the pathology is affecting. Rolleston & McNee (1929) and modified by Maclagan (1964), they classified jaundice into three categories.^[3]

- Haemolytic (Pre-hepatic): The pathology occurs prior to the liver.
- Hepatocellular (Hepatic): The pathology which is located within the liver.
- Obstructive (Post-Hepatic): The pathology which is located after the conjugation of bilirubin in the liver.

Tissue deposition of bilirubin may occur only in the presence of serum hyperbilirubinemia & it is a sign of either liver disease or less often a haemolytic disorder. The degree of increased serum bilirubin level can be estimated by physical examination. Slightly increase in serum bilirubin level is best detected by the examination of the sclera, which has a particular affinity for bilirubin because of their high elastin content.^[4]

Aims of the study is to compare the level of serum bilirubin and various other liver related enzymes in different types of Jaundice in patients attending the Hi-Tech Medical College and Hospital, Pandara, Rasulgarh, Bhubaneswar, Odisha.

MATERIALS AND METHODS

This present study was conducted in the department of Biochemistry, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha, India in collaboration with the department of medicine & department of surgery from August 2010 to August

2011. The study include total 50 subjects, out of which 20 were controls and 30 were Jaundice cases. Thirty jaundice cases were divided into 10(Pre-Hepatic), 10(Hepatic) & 10(Post-Hepatic) jaundice patients according to inclusion-exclusion criteria. For control blood sample were collected from the healthy staff of biochemistry department from HMCH and subjected to the following biochemical test:

1. Serum Total bilirubin- Mod. Jendrassik & Grof's Method^[5]
2. Serum direct bilirubin - Mod. Jendrassik & Grof's Method.^[5]
3. Serum indirect bilirubin - Mod. Jendrassik & Grof's Method.^[5]
4. SGOT (AST) - Reitman & Frankel's Method.^[6]
5. SGPT (ALT)- Reitman & Frankel's Method.^[6]
6. ALP (Alkaline phosphatase) - Mod.Kind & King's Method.^[7]

All the data were entered and analyzed by SPSS version 18. We used student t-test to find the statistical significance. A P-value<0.05 was to be considered statistically significant.

RESULTS & DISCUSSION

Thirty clinically diagnosed patients of jaundice (Pre-hepatic, Hepatic, and Post-hepatic) were included in the study. Out of 30 jaundice patients, 10 clinically diagnosed Pre-Hepatic Jaundice patients, 10 clinically diagnosed Hepatic patients and 10 Post-Hepatic Jaundice patients were obtained from the department of Medicine & department of Surgery. The blood sample were collected from all the 30 patients & subjected to the tests.

Table 1: Clinical Data

S.No	Parameter (Mean±S.D)	Control	Cases		
			Pre-Hepatic	Hepatic	Post-Hepatic
1.	Age (Years)	37.45±6.16	36.80±2.52	36.70±5.63	36.10±6.7
2.	Weight (Kg)	60.85±6.42	61.60±7.16	61.70±5.9	60.00±6.12
3	BMI (Kg/m ²)	21.82±1.09	25.55±0.35	25.68±0.68	26.11±0.30

Table 2: bilirubin levels in the study groups

S.No	Parameter (Mean±S.D)	Control	Cases		
			Pre-Hepatic	Hepatic	Post-Hepatic
1.	Total Bilirubin (mg/dl)	1.51±0.22	3.07±0.42	2.96±0.34	2.95±0.09
2.	Direct Bilirubin (mg/dl)	0.74±0.16	1.67±0.36	1.71±0.21	1.86±0.05
3.	Indirect Bilirubin (mg/dl)	0.77±0.15	1.40±0.10	1.27±0.12	1.08±0.09

[Table 1] Shows the clinical data of the study groups. In which the mean age of Control is about 37.45±6.16 years & that of jaundice cases i.e. Pre-Hepatic is 36.80±2.52 years, Hepatic is 36.70±5.63 years & Post-Hepatic is 36.10±6.7 years. The mean weight of the Control is 60.85±6.42 kg, Pre-Hepatic is 61.60±7.16 kg, Hepatic is 61.70±5.9 kg & Post-Hepatic is 60.00±6.12 kg. Body Mass Index (BMI) of the control group was found to be 21.82±1.9 and that of Pre-Hepatic jaundice is of 25.55±0.35,

Hepatic jaundice is of 25.68±0.68, Post-Hepatic jaundice is of 26.11±0.30 kg/m².

[Table 2] Shows the Bilirubin profile of the study groups. The Total bilirubin of control groups was found to be about 1.51±0.22 mg/dl and that of jaundice cases were higher than Control cases. Out of which Pre-Hepatic Jaundice cases were showing the highest level of mean 3.07±0.42 mg/dl. Whereas the Hepatic Jaundice cases are of 2.96±0.34 mg/dl & Post-Hepatic Jaundice cases are of 2.95±0.09mg/dl.

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Likewise the Direct Bilirubin of control is about 0.74 ± 0.16 mg/dl but that of Pre-hepatic jaundice patients having 1.67 ± 0.36 mg/dl, Hepatic jaundice patients having 1.71 ± 0.21 and Post-hepatic jaundice patients having 1.86 ± 0.05 mg/dl. It means that the Direct bilirubin level is found to be highest in Post-hepatic jaundice patients. In the Control, the Indirect Bilirubin was found to be 0.77 ± 0.15 mg/dl & that of Pre-hepatic, Hepatic and Post-hepatic were of higher range. The Pre-hepatic cases exhibited the highest of 1.40 ± 0.10 mg/dl indirect bilirubin level.

[Table 3] exhibits the enzymatic pattern related the liver function test. The Serum Glutamate Oxaloacetate Transaminase (SGOT) of Control was

around 35.7 ± 3.04 IU/L but that of jaundiced cases were found to be the double i.e. in case of Pre-hepatic is 75.7 ± 3.59 , Hepatic is 79.2 ± 6.97 , Post-hepatic is 89 ± 7.58 IU/L. Likewise for Serum Glutamate Pyruvate Transaminase (SGPT) Control is around 35.65 ± 3.24 and in Pre-hepatic is 76.8 ± 4.34 , Hepatic is 96.1 ± 4.34 & Post-hepatic is 91.3 ± 7.0 IU/L. Out of which SGPT was found higher in case of Hepatic jaundice patients. The Alkaline Phosphatase (ALP) was found very higher in case of Post-hepatic jaundice as compared with other jaundice groups. So it was concluded that ALP would be very high in case of Post-hepatic jaundice patients.

Table 3: enzymes related to the liver function test

S.No	Parameter (Mean±S.D)	Control	Cases		
			Pre-Hepatic	Hepatic	Post-Hepatic
1.	SGOT (IU/L)	35.7 ± 3.04	75.7 ± 3.59	79.2 ± 6.97	89 ± 7.58
2.	SGPT (IU/L)	35.65 ± 3.24	76.8 ± 4.34	96.1 ± 3.47	91.3 ± 7.0
3.	ALP (IU/L)	68.5 ± 4.32	112.2 ± 4.89	119 ± 5.91	172 ± 2.3

Table 4: comparison of bilirubin levels in study groups.

S.No	Parameter (Mean±S.D)	Control	Cases		
			Pre-Hepatic	Hepatic	Post-Hepatic
1.	Total Bilirubin	1.51 ± 0.22	3.07 ± 0.42	2.96 ± 0.34	2.95 ± 0.09
			P<0.001	P<0.001	P<0.001
2.	Direct Bilirubin	0.74 ± 0.16	1.67 ± 0.36	1.71 ± 0.21	1.86 ± 0.05
			P<0.001	P<0.001	P<0.001
3.	Indirect Bilirubin	0.77 ± 0.15	1.40 ± 0.10	1.27 ± 0.12	1.08 ± 0.09
			P<0.001	P<0.005	P<0.001

(Statistically Significant at p-value <0.05)

Table 5: Comparison of enzymes related to liver function in study groups (control & pre-hepatic jaundice)

S.No	Parameter (Mean±S.D)	Control	Pre-Hepatic Jaundice	"P" Value
1.	SGOT	35.7 ± 3.04	75.7 ± 3.59	P<0.001
2.	SGPT	35.65 ± 3.24	76.8 ± 4.34	P<0.001
3.	ALP	68.5 ± 4.32	112.2 ± 4.89	P<0.001

(Statistically Significant at p-value <0.05)

[Table 4] shows the Comparative Study of Bilirubin profile between control and Jaundice (Pre-hepatic, Hepatic & Post-hepatic). The Total Bilirubin was found to be significantly raised (P<0.001) in Pre-hepatic on compared to Control. Similar observation is then in Hepatic and Post-hepatic cases as compared to control. In the same table, we compared Direct Bilirubin between Control, Pre-hepatic, Hepatic & Post-hepatic Jaundice patients. It shows that they are significantly high (P<0.001) compared with Control. Similarly, Indirect bilirubin levels were compared between Control, Pre-hepatic, Hepatic & Post-hepatic Jaundice cases. It is highly

elevated in Pre-hepatic & Post-hepatic case as compared to Controls (P<0.001). Whereas the Indirect Bilirubin levels shows a P-value of P<0.005, when controls are compared with Hepatic Jaundiced Cases.

[Table 5] Shows the comparative study of Enzymatic pattern related to liver function tests in between the study groups i.e. Control & Pre-hepatic Jaundice cases. The SGOT was found to be highly raised (P<0.001) in Pre-hepatic jaundice cases as compared to Control. Same in case of SGPT & ALP (P<0.001)

Table 6: comparison of enzymes related to liver function in study groups (control & hepatic jaundice)

S.No	Parameter (Mean±S.D)	Control	Hepatic Jaundice	"P" Value
1.	SGOT	35.7 ± 3.04	79.2 ± 3.04	P<0.001
2.	SGPT	35.65 ± 3.24	96.1 ± 3.47	P<0.001
3.	ALP	68.5 ± 4.32	119 ± 5.91	P<0.005

(Statistically Significant at p-value <0.05)

Table 7: Comparison of enzymes related to liver function in study groups (control & post-hepatic jaundice)

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S.No	Parameter(Mean±S.D)	Control	Post-Hepatic Jaundice	“P” Value
1.	SGOT	35.7±3.04	89±7.58	P<0.001
2.	SGPT	35.65±3.24	91.3±7.0	P<0.001
3.	ALP	68.5±4.32	172±2.30	P<0.001

(Statistically Significant at p-value <0.05)

[Table 6] Shows the comparison of enzymes related to liver function in study groups i.e. in between Control & Hepatic jaundice cases. The SGOT & SGPT seems to be highly elevated (P<0.001) when controls are compared with Hepatic jaundice patients. But ALP was found to be raised significantly (P<0.005) when compared to control.

[Table 7] Also shows the comparative study done between Control & Post-hepatic case by taking the parameter of enzyme related to liver function test. In this comparative study, it has been noticed that SGOT, SGPT & ALP seems to be highly elevated in Post-hepatic jaundice cases (P<0.001).

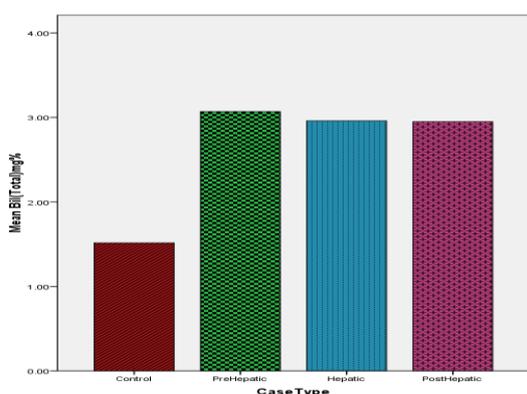


Figure 1: Shows the comparison of the Total Bilirubin in different study groups.

Above graph [Figure 1] Shows the comparison of the Total Bilirubin in different study groups. Total bilirubin is raised in Pre-hepatic, Hepatic & Post-hepatic Jaundice cases as compared to Controls. But it is highest in cases of Pre-hepatic jaundice as compared with other two jaundice sub-groups i.e. Hepatic & Post-hepatic.

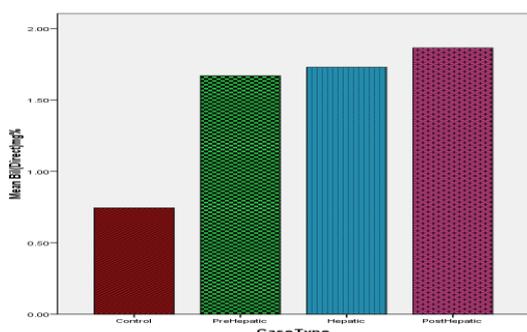


Figure 2: Shows the comparative study of Direct Bilirubin in mg% of Control, Pre-hepatic, Hepatic & Post-hepatic.

Above graph [Figure 2] Shows the comparative study of Direct Bilirubin in mg% of Control, Pre-hepatic, Hepatic & Post-hepatic. It has been noticed

that all three cases of jaundice have higher value than that of control which is within the normal range. The Post-hepatic Jaundice patients show the highest value as compared with Pre-hepatic & Hepatic jaundice cases.

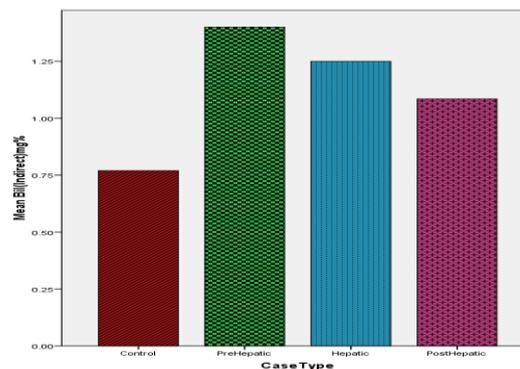


Figure 3: Shows the comparative study of Indirect Bilirubin with Control, Pre-hepatic, Hepatic & Post-hepatic jaundice cases.

Above graph [Figure 3] Shows the comparative study of indirect bilirubin with control, Pre-hepatic, Hepatic & Post-hepatic jaundice cases. It shows that Control is within normal level but jaundice patients have higher value out of which Pre-hepatic jaundice patients have highest value as compared with Hepatic & Post-hepatic jaundice patients.

CONCLUSION

From the above observations, it can be concluded that high serum bilirubin level is a marker of Jaundice. Increased direct bilirubin and alkaline phosphatase (ALP) specifically points towards obstructive Jaundice, Increased indirect bilirubin level points towards pre-hepatic (Hemolytic) jaundice whereas increased bilirubin (Direct & Indirect) along with other liver related enzyme with significantly increased SGPT levels as found in other types of jaundice points towards hepatic jaundice. Further study is required to establish the role of serum bilirubin to specify the underlined cause of Jaundice and its prognosis.

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How to cite this article: Yadav KP, Yadav MK, Yadav R, Mohapatra TK, Mohapatra RK, Mishra PK. Comparative Study of the Serum Bilirubin and Various Other Liver Related Enzymes in Different Types of Jaundice. Ann. Int. Med. Den. Res. 2018; 4(4):BC42-BC46.

Source of Support: Nil, **Conflict of Interest:** None declared