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ORIGINAL RESEARCH ARTICLE

A COMPARATIVE STUDY OF SERUM TOTAL CHOLESTEROL IN PRE AND POST-CHOLECYSTECTOMY PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Background: Laparoscopic cholecystectomy has many advantages over laparotomy like smaller incisions, reduced surgical trauma, less post-operative pain, faster recovery time, shorter hospital stay, and faster return to normal activities or routine work. So, it is considered as the gold standard for surgical treatment of benign gallbladder disease like cholelithiasis.The aim of this study was to elucidate the association of serum total cholesterol with cholelithiasis patients and effect of cholecystectomy on the same by laparoscopic procedure.

Methodology: This study was conducted prospectively on 109 patients in a tertiary care hospital in eastern Uttar Pradesh, India. From January 2019 to December 2019, patients admitted for cholecystectomy in General surgery ward of this hospital were included in this study. Fasting blood samples of the patients were collected firstbefore surgery and then 12-24 hours after surgery and were analyzed in the biochemistry laboratory of the institute after proper control and calibration, meeting the quality standard of the laboratory. Values of serum total cholesterol thus obtained were compared with each other.

Results: In our study, 84.4% patients were females with mean age of 43.1 years and 15.6% patients were males with mean age of 40.8 years. A reduction in mean value of serum total cholesterol was noted pre-operatively from 221.1 mg/dL to 203.5 mg/dL post-operatively.

Conclusion: From our study, we concluded that laparoscopic cholecystectomy is beneficial in lowering down the serum total cholesterol and hence reduces the risk factors for associated diseases.

Introduction:-

Cholelithiasis is one of the most common gallbladder related disorder. Many patients in cholelithiasis remain asymptomatic or are diagnosed on incidental finding at the time of abdominal ultrasonography for unrelated diseases.[1]Cholelithiasis is a common disorder afflicting about 10% to 20% of adult populations in developing countries. It occurs predominantly in females and the incidence increases with age, possibly resulting from a progressive increase in the secretion of biliary cholesterol.[2][3]It has been reported that females are at 2-3 times higher risk for gallstone disease as compared to males probably owing to role of steroid hormones and also the risk

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increases as the number of pregnancies increases.[4]It is generally reported in people having diet rich in saturated fats and reduced intake of fiber content in diet. Also age, ethnicity, gender and sedentary lifestyle plays an important role to increase the risk for cholelithiasis.[5]Symptomatic cholelithiasis is normally treated by cholecystectomy.[6]The laparoscopic cholecystectomy isregarded as the 'gold standard' for cholelithiasis. Nowadays, most of the cholecystectomies are performed by laparoscopic procedure since it has various benefits of early recovery in terms of early return of bowel functions, lesser post-operative pain, reduced duration of hospital stay and early returning towards daily routine activities.[7]

Cholesterol stone formation requires the supersaturation of bile with cholesterol, which results from increased biliary cholesterol output, decreased bile acid synthesis, or both gallbladder hypomotility and mucinhypersecretion promote the precipitation and agglomeration of cholesterol monohydrate crystals into stones. A significant factor is the supersaturation of bile via cholesterol which is water insoluble, secreted from uni-lamellar phospholipid vesicle through canalicular membrane. The solubility of cholesterol in bile require a sufficient level of bile salts as well as phospholipids (predominantly phosphatidylcholine) i.e., lecithin. Secreted cholesterol gets supersaturated and leads to dysmotility of gallbladder causing cholesterol crystal aggregation and delaying in large intestine's transit time period which favours reabsorption of deoxycholic acid, resecting ileum in depletion of the bile acid's secretary pool have been implicated in formation of gallstones. Also, the appearance of cholesterol stones varies depending on the cholesterol content. The aim of this study was to elucidate the serum total cholesterol level pre and post-cholecystectomy patients operated by laparoscopic procedure.[8]

Methodology:-

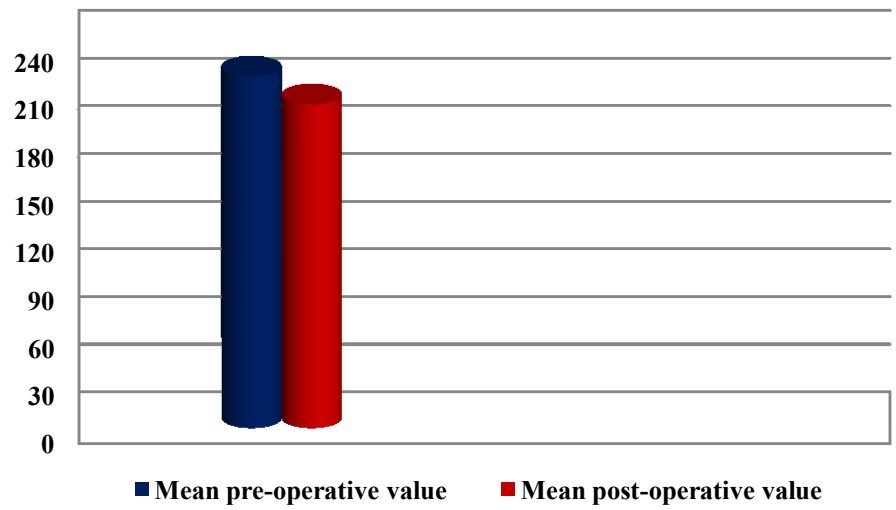
It was a prospective study conducted in department of biochemistry at Uttar Pradesh University of Medical Sciences (U.P.U.M.S.) Saifai,Etawah, which is one of the largest tertiary care Hospital and Medical college of eastern Uttar Pradesh, India, after the clearance from the institute's ethical committee. The duration of the study was one year i.e., from January 2019 to December 2019. The study was carried out on all symptomatic male and female patients of age above 18 years who were diagnosed as having gallstones and requires simple cholecystectomy. All patients undergoing cholecystectomy electively by laparoscopic method were included in this study.All those patients who underwent cholecystectomyin emergency, by open method, below 18 years of age, on anti-hyperlipidemic drugs or non-cooperative patients who refused to give written consent for participation in this study were excluded from the study. Around 3ml of fasting venous blood sample of the patient was evacuated before surgery into a plain vial by venepuncture and it was then allowed to clot at room temperature for about 1 hour. The blood sample was then centrifuged in the biochemistry laboratoryof the institute at 4000 rpm for 4 min. The serum thus formed after the centrifugation of the venous blood sample was analyzed immediately for serum total cholesterol by enzymatic colorimetric method on fully automatic analyzer, Selectra pro XL with commercial kits manufactured by ELITech group. Again around 3ml of second blood sample of the same patient was collectedfrom the ward of general surgery by venepuncture after 12-24 hours of laparoscopic cholecystectomy. The sample was again allowed to clot at room temperaturefor 1 hour, followed by centrifugation and was analysed immediately on the same instrument by the same method. To check the accuracy of assays, control sera such as ELITROL I and ELITROL II were used. These controls were performed and validated before the patient samples are assayed. Out of control value, if any, was calibrated at the same time to get the result within the defined range.

Results:-

In all 109 patients of cholecystectomy those were included in this study, a substantial decrease in serum total cholesterol level was observed. From these 109 patients, 17 (15.6%) weremales with mean age of 40.8 years while majority 92 (84.4%) were females with mean age of 43.1 years as shown in Table 1. The mean pre-operative value of serum total cholesterol was 221.1 mg/dL, which was decreased post-operatively by 17.6 mg/dL and was noted as 203.5 mg/dL as shown in graph.

Table 1:- Total number of male and female patients with their percentage and mean age.

	TOTAL PATIENTS	PERCENTAGE	MEAN AGE (years)
MALE	**17**	**15.6 %**	**40.8**
FEMALE	**92**	**84.4 %**	**43.1**



Mean serum total cholesterol values at pre and post-operative follow up in mg/dL

Discussion:-

The gallbladder is amongst the most common surgically resected organs, and the number of cholecystectomies has increased by more than 50% in the past decade.Chronic cholecystitisis the most commonly encountered disease of the gallbladder and the overwhelming majority of cholecystectomies are performed for chronic cholecystitis. It is associated with cholelithiasis in more than 90% of the cases. Therefore, as observed with gallstones and other research studies, there is female predominance.The appearance of cholesterol stones varies depending on the cholesterol content.[9][10]Bile is the only significant pathway for elimination of excess cholesterol from the body either as free cholesterol or as bile salts. Cholesterol is water insoluble and is rendered water soluble by aggregation with bile salts and lecithin co-secreted into bile. When cholesterol concentration exceeds the solubilising capacity of bile, cholesterol can no longer remain dispersed and it nucleates into the solid cholesterol monohydrate crystals. Some conditions are thus met to permit the formation of cholesterol gallstones. First, bile must be supersaturated with cholesterol. Second, nucleation must be kinetically favourable, and lastly cholesterol crystals must remain in the gall bladder long enough to aggregate into stones. Nucleation is promoted by micro-precipitation of inorganic or organic calcium salts serving as nucleation sites for cholesterol stones. Gallbladder stasis plays a key role in permitting stone formation and growth. As bile becomes more concentrated during storage in gallbladder, cholesterol saturation of bile may also further increase. Since around half of the patients of cholelithiasis have abnormal lipid profile, this would increase the incidence of coronary artery disease and stroke.[11][12]

A study by Ahi et al reported a similar result to our study in which most patients having lipid alterations in cholelithiasis were females and having same pattern of serum total cholesterol level lowering as seen in our study.[13]Another study similar to ours, by Kataan et al and Erpecum et al found a higher level of serum total cholesterol in patients having cholelithiasis.[14][15] In accordance with our study, another study also reported a higher lipid levels in gallstone diseased patients.[16]Channa et al observed in their study that increased steroid synthesis because of free cholesterol led to lower bile acid production which caused hyper-saturation of bile with cholesterol.[17]Our results are also in accordance with the study conducted by Jindal N et al [18] and Pettiti BD et al [19] in which they found that the total serum cholesterol levels in post-cholecystectomy patients are lower than pre-operative levels. Roda E et al evaluated that the lowering of cholesterol in post-cholescystectomy period due to a more rapid circulation of the bile acid pool in fasting cholecystectomised patients leading to improved solubility of cholesterol in bile [20].Singh et al in their study attributed gallstone formation and lipid dysregulation to estrogens as well as HDL might cause inhibitions of hepatic cholesterol synthesis. It is reported that progesterone also aids in promoting formation of saturated bile through smooth muscle relaxation and impairment of gall bladder emptying.[21] Likewise, in a study by Singletary et al the presence of progesterone and estrogen receptor on gall bladder concluded that they must have an effect on the gall bladder's function.[22]

Limitations:-

This study was conducted at one centre only and with a limited sample size. Additionally, shorter follow-up time period could also have been a source of bias in the study, since longer follow-up time period are associated with lack of patient compliance in regular follow up visits especially at the low resourced, under-developed rural population. So, future multicentric studies with larger sample sizeinvolving cholelithiasispatients with different type of gallstones are recommended for more accurate results.

Conclusion:-

In the light of findings, it was concluded that laparoscopiccholecystectomy in gallstone diseased patients elicited a favourable response in significantly lowering the levels of serum total cholesterol. These results can be explained by the fact that when significant increase in bile acids and phospholipids secretion rate after cholecystectomy occurs, which leads to a definitive improvement in bile composition and a significant reduction in bile acid pool after surgery that may occur due to rapid cycling around the entero-hepatic circulation, leading to a significant reduction in serum total cholesterol. This can be accounted to the fact that serum total cholesterol is the precursor to bile acids, so this reduction in the bile acids pool leads to a significant reduction in serum total cholesterol after cholecystectomy.

Conflicts of Interest:
None.

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