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# Evaluation of bile duct stones extracted by ERCP (Endoscopic Retrograde Cholangio-Pancreatography).

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**ABSTRACT… Objective:** To determine the frequency of different types of gallstones on ERCP stone extraction from bile duct. **Study Design:** Cross Sectional study. **Setting:** Department of Gastroenterology of the Nishtar Hospital Multan. **Period:** September 2019 to October 2020. **Material & Methods:** Patients with bile duct stones on imaging of either sex aged 18 – 70 years were included in our study while patients with IHD, malignancies, liver cirrhosis, asthma, TB, COPD, ILD and pregnant women were excluded from our study. During ERCP the gross appearance of extracted stones and related findings were noted. **Results:** Our study included 139 patients meeting inclusion criteria, of these 139 study cases, 49 (35.3%) were male and 90 (64.7%) were female patients with bile duct stone. Mean age was 45.78 ± 12.05 year (range; 27 – 68 years). Of these 139 study cases, 56 (40.3%) were from rural areas, 83 (59.7 %) were from urban areas, 52 (37.4%) had poor socioeconomic status and 87 (62.6%) were from middle income family background. Diabetes was noted in 35 (25.2%), hypertension in 53 (38.1%) and obesity in 32 (23 %) (Mean BMI was 26.53±214kg/m$^2$). Mean stone size in our study was 15.82 ± 6.34 mm while 78 (56.12 %) had single stones. Pure cholesterol gallstones were noted in 47 (33.8%), mixed cholesterol stones in 71 (51.1%) and brown pigmented gall stones in 21 (15.1%). **Conclusion:** Mixed cholesterol stones were more frequent followed by pure cholesterol and brown pigmented stones in bile duct gallstones patients. Mixed cholesterol stones were significantly associated with rural residential status and hypertension while brown pigmented stones were residential status, hypertension and obesity.

**Key words:** Bile Duct, Gallstones, Mixed Cholesterol.

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## INTRODUCTION

Bile duct stone disease (choledocholithiasis) is a common problem in daily clinical practice.[1] Understanding completely the types of bile duct stones, and the pathophysiological changes underlying the formation of each type of stone remains a challenge for current and future optimal management.[2,3] Based on chemical composition and gross appearance, gallstones are divided into three types. The majority of gallstones are cholesterol stones which consist mainly of cholesterol monohydrate crystals and precipitates of amorphous calcium bilirubinate often with calcium carbonate or phosphate.[4] These stones are usually subclassified as either pure cholesterol or mixed stones that contain at least 50% cholesterol by weight. Pure cholesterol crystals are typically yellow in color and nodular.[5] Mixed stones are grey white to black, tend to be smaller and faceted. Established risk factors for cholesterol stones include female gender, obesity, dyslipidemia, diabetes. Remaining gallstones are pigment stones that contain mostly calcium bilirubinate and are sub-classified into 2 groups black pigment stones and brown pigment stones.[6] Rare gallstones (~0.5%) include calcium carbonate stones and fatty acid calcium stones. Gallstones are also classified by their location as intrahepatic, bile duct stones (choledocholithiasis).[7,8] Intrahepatic stones are predominantly brown pigment stones. Gallbladder stones are mainly cholesterol stones with a minority being black pigment stones.[9] Bile duct stones are composed mainly of mixed

cholesterol stones.[10]

Clinical presentations associated with bile duct stone include biliary pain, obstructive jaundice, cholangitis, and biliary pancreatic. Imaging modalities used for diagnosis include transabdominal ultrasound and MRCP. ERCP has been considered the standard treatment for removal of bile duct stones.[11] Stones in the bile duct may be secondary that come from gallbladder or primary that form denovo within the bile duct. Secondary stones are usually of cholesterol type. Black pigment stone which are associated with chronic hemolysis also form in the gallbladder but rarely enter the bile duct. Most pigment stones in the bile duct are primary and are associated with bile stasis, periampullary diverticulae and recurrent biliary tract infections.[12]

This study was conducted to document different types of gallstones on ERCP to help clinicians to ascertain current magnitude of underlying etiological factors of choledocholithiasis in our population which will help them to anticipate such underlying causes for better management of these patients.

## MATERIAL & METHODS

This Cross Sectional study was conducted in the Department of Gastroenterology of the Nishtar Hospital Multan from 01-09-2019 to 30-10-2020 using non-probability consecutive sampling technique. A total 139 patients undergoing gallstone extraction from bile duct on ERCP were included. Sample size was calculated using 10% frequency of pure cholesterol[13] employing WHO sample size calculator at 95% CI and 5% margin of error. Patients with bile duct stones on imaging of either sex aged 18-70 years were included in our study while patients with IHD, malignancies, liver cirrhosis, asthma, TB, COPD, ILD and pregnant women were excluded from our study. Basic demographics were noted and informed consent was taken from ensuring confidentiality and fact that no risk involved to patient while taking part in the study. During ERCP the gross appearance of extracted stones and related findings were noted. Pure cholesterol gallstones were defined by their gross appearance, being yellow in color with nodular or smooth surface. Mixed cholesterol gallstones were defined by their gross appearance as grey white to black, mostly smaller and faceted. Brown pigment gallstones; based on gross appearance.

Data was analyzed with statistical analysis program (SPSS version 20). Frequency and percentage was computed for qualitative variables like gender, diabetes, obesity, age groups and types of bile duct stones. Mean SD was presented for quantitative variables like age. Effect modifiers like age, gender, residential status and diabetes were controlled by stratification. Post stratification chi Square test was applied to see their effect on outcome. P value of less than 0.05 was considered statistically significant. This study was approved by ethical committee (23483/NMU & H).

## RESULTS

Our study included 139 patients meeting inclusion criteria, of these 139 study cases, 49 (35.3%) were male and 90 (64.7%) were female patients with bile duct stone. Mean age was 45.78 ± 12.05 year (range; 27-68 years). Of these 139 study cases, 56 (40.3%) were from rural areas, 83 (59.7%) were from urban areas, 52 (37.4%) had poor socioeconomic status and 87 (62.6%) were from middle income family background. Diabetes was noted in 35 (25.2%), hypertension in 53 (38.1%) and obesity in 32 (23%) (Mean BMI was 26.53±214kg/$m^2$). Mean stone size in our study was 15.82 ± 6.34 mm while 78 (56.12 %) had single stones. Pure cholesterol gallstones were noted in 47 (33.8%), mixed cholesterol stones in 71 (51.1%) and brown pigmented gall stones in 21 (15.1%).

## DISCUSSION

Gallstones in the bile duct are the major indication endoscopic retrograde cholangiopancreatography (ERCP) and have significant impact on quality of life and productivity of the patients.[14,15] There has been significant improvements in management strategies in recent decades with rapid advancement and evolution of research in biliary system.[14]

| Study Parameters | | Type of Stones | | | P-Value |
|---|---|---|---|---|---|
| | | Pure Cholesterol | Mixed Cholesterol | Brown Pigmented | |
| Gender | Male (n=49) | 17 | 28 | 04 | 0.226 |
| | Female (n=90) | 30 | 43 | 17 | |
| Age groups | Up to 50 Years (n=79) | 33 | 35 | 11 | 0.073 |
| | More than 50 Years (n=60) | 14 | 36 | 10 | |
| Residential status | Rural (n=56) | 11 | 34 | 11 | 0.014 |
| | Urban (n=83) | 36 | 37 | 10 | |
| Diabetes | Yes (n=35) | 09 | 21 | 05 | 0.437 |
| | No (n=104) | 38 | 50 | 16 | |
| Hypertension | Yes (n=53) | 11 | 32 | 10 | 0.037 |
| | No (n=86) | 36 | 39 | 11 | |
| Obesity | Yes (n=32) | 06 | 16 | 10 | 0.007 |
| | No (n=107) | 41 | 55 | 11 | |

**Table-I. Gallstone distribution with regards to different study parameters.**

Our study included 139 patients meeting inclusion criteria, of these 139 study cases, 49 (35.3%) were male and 90 (64.7%) were female patients with bile duct stone. Odemis et al[16] has also reported 62% female patients with bile duct gall stones, similar to our results. Elghamry et al[17] from Egypt has also reported 70% female gender preponderance. Sattar et al[18] from Karachi has also reported 73% patients with bile duct stones were females, similar to our results. Lauri et al[19] from UK has also reported 55% female patients with bile duct gallstones. However Khawar et al[20] from Karachi has reported different results showing male gender predominance in bile duct gall stone patients.

Mean age was 45.78 ± 12.05 year (range; 27-68 years). Odemis et al[16] has reported 63.3 ± 17 years mean age, which is slightly higher than our results. Elghamry et al[17] from Egypt has also reported 48.90 ± 11.84 years mean age of bile duct stone patients, close to our results. Sattar et al[18] from Karachi has also reported 48 years mean age of bile duct stone patients, close to our results. Lauri et al[19] from UK has reported 69 years mean age of these patients.

Of these 139 study cases, 56 (40.3%) were from rural areas, 83 (59.7%) were from urban areas, 52 (37.4%) had poor socioeconomic status and 87 (62.6%) were from middle income family background. Diabetes was noted in 35 (25.2%), hypertension in 53 (38.1%) and obesity in 32 (23%) (Mean BMI was 26.53±214kg/m$^2$). Elghamry et al[17] from Egypt has also reported 10% controlled diabetes and 30% controlled hypertension which is in compliance with our results. Sattar et al[18] from Karachi has also reported similar results.

In our study 78 (56.12%) had single stones. Elghamry et al[17] from Egypt has also reported 60% single stones, similar to our results.

Odemis et al[16] has reported similar results. Pure cholesterol gallstones were noted in 47 (33.8%), mixed cholesterol stones in 71 (51.1%) and brown pigmented gall stones in 21 (15.1%). In literature, cholesterol has been reported to be main component which is found in as many as 80% extracted stones with 10% of these stones may be pure cholesterol, in our study cholesterol stones were predominantly more frequent. High burden of cholesterol stones in our population points towards early management strategies, as these are associated with high risk of infections.

## CONCLUSION

Mixed cholesterol stones were more frequent followed by pure cholesterol and brown pigmented stones in bile duct gallstones patients. Mixed cholesterol stones were significantly associated with rural residential status and hypertension while brown pigmented stones were residential status, hypertension and obesity. Prevalence of high proportion cholesterol stones emphasizes the need for early management to avoid future complications like infection.



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