

**CHEMICAL COMPOSITION, CLINICAL MANIFESTATIONS AND
AETIOPATHOGENESIS OF GALLSTONES IN A COHORT OF PATIENTS
WITH GALLSTONE DISEASE**

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Identification of aetiopathogenesis of gallstones (GS) is important as it causes a group of upper gastrointestinal diseases resulting in significant surgical casualties. As there is a changing pattern of chemical composition of GS in Asians, separate data on aetiopathogenesis of GS in different Asian populations is essential. The objectives of this study were to identify the different types of GS and to describe their chemical composition, characteristic physical features (internal and external), clinical presentation and predisposing factors in a cohort of symptomatic patients with GS in Kandy district, Sri Lanka.

A total of 102 patients with symptomatic GS admitted to the Surgical Unit, Teaching Hospital, Peradeniya, Sri Lanka, over a period of 1 ½ years (May 2011 to December 2012) were included in the study. There were 77 (76%) females and 25 (24%) males and their mean age was 46.1 ± 11.6 years. Chemical analysis of GS was done by Fourier Transform Infrared Spectroscopy, X-Ray Diffraction and Scanning Electron Microscopy while Atomic Absorption Spectroscopy was used for metal analysis.

The GS of the study group was composed of 48 (47%) black pigment, 38 (37%) mixed cholesterol, 10 (10%) pure cholesterol and 6 (6%) brown pigment GS. Cholesterol and calcium bilirubinate were identified as the main chemical compounds in GS. Calcium carbonate and calcium phosphate were found in the most of the GS as minor compounds while calcium palmitate was identified only in 6 (6%) GS samples. Similar chemical compositions were found in the core of mixed cholesterol and black pigment GS. Calcium, zinc and copper concentrations were high in pigment GS than that of cholesterol GS. Toxic heavy metals (Pb and Cd) were detected in all the types of GS with highest concentration in pigment GS. Though widely diverse external morphological features were observed in GS, characteristic features were identified for different types of GS. Majority of pure cholesterol GS were solitary and round to oval in shape while mixed cholesterol GS were multiple and faceted in shape. Dark colour, mulberry shape, multiple stones likely to be black pigment GS while brown pigment GS were brownish and round to oval in shape. Cholesterol crystals were arranged radially in pure cholesterol GS while it was seen in crescentic pattern in mixed cholesterol GS. Black pigment GS had blackish and homogenous appearance and brown pigment stones had dark brown and light brown crescentic layers in their cross sections.

Migration of large solitary gallbladder (GB) stones was unlikely and age of the patients presented with bile duct stones (52.0 ± 13.6 years) was significantly old than that of GB stones (44.8 ± 10.8 years). Biliary colic ($n = 63$, 61%) was the commonest presentation of GB stones and majority of these patients ($n = 56$, 89%) had dyspeptic symptoms other than the typical biliary colic symptoms. The chemical composition of GB stones had no significant effect on the clinical symptoms. Among the considered aetiological factors, gender, ethnicity, Body Mass Index (BMI), type II Diabetes Mellitus (DM), serum triglycerides and parity were significantly different among patients with different types of GS. Compared to pigment GS, cholesterol GS were significantly common among the patients with Moor ethnicity, $BMI > 25 \text{ kg/m}^2$ and high serum TG. Significant differences in aetiological factors were observed among the patients with pure cholesterol and mixed cholesterol GS and mixed cholesterol and black pigment GS. However, none of the factors were significantly different among patients with black pigment and brown pigment GS. A significant difference was not observed for age, family history, smoking, alcohol consumption, use of exogenous oestrogen and fasting blood glucose in any of the above comparisons.

The GS in this Sri Lankan study cohort was mainly composed of black pigment and mixed cholesterol GS and it is likely to have a common origin from pigment nucleus. GS had characteristic physical features which can be used in identification of aetiopathogenesis of GS. Females are the risk group of GS disease while gender, ethnicity, parity, BMI, type II DM and serum TG were the predisposing factors of different types of GS.

