BIOCHEMICAL COMPARATIVE STUDY OF GALL STONES IN RIYADH SAUDI ARABIA

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ABSTRACT

Background: To investigate the chemical composition of gallstones in Riyadh, Saudi Arabia and to identify the risk factors involved. The study was undertaken in central laboratory Riyadh, Saudi Arabia during one-year period from September 2000 to August 2001.

Materials and Methods: All gallstones sent to central laboratory Riyadh were analyzed. Analysis was done using wet chemical method. The contents of cholesterol and pigments were estimated in all stones.

Results: A total of 113 gallstones were analyzed. Majority of stones (57%) were of cholesterol type followed by mixed (39%) and pure pigment stones (4%). The ratio of female to male patients was 3.6:1. The incidence was higher in Saudis (78%) as compared to Non-Saudis (22%).

Conclusion: It is concluded that in the central region of Saudi Arabia (Riyadh) the gall stone pattern resembles the western countries like United States of America, Germany and the rapidly developing countries like Singapore and Korea. The various risk factors responsible for this distribution are outlined.

Key words: Gallstones, Chemical Composition, Wet Chemical Method, Risk Factors

INTRODUCTION

Gallstone disease is one of the most common Gastro-intestinal diseases.[1,2] About 10 - 20% of adult population in developed countries has gallstone disease. In United States alone more than 3×10^7 people develop this problem. Nearly one million new patients annually are found to have gallstones, of which half undergo surgery. Most gall stones are silent (80%) and most subjects remain free of biliary pain or stone complications for decades.[3] The formation of gallstone in vivo takes years and it is quite difficult to monitor such events from nucleation to consolidation.[4] The incidence of gall stones varies markedly depending upon geographic area, age, sex, diet, drug intake, presence of obesity and certain gastrointestinal diseases. Surprisingly, in last few decades there has been significant rise in gallstone diseases in children.[5] Pigment stones are more frequently associated with hemolytic anaemias, cirrhosis and hepato-cellular disease.[6] The gallstones chemically are either of mixed variety, pure cholesterol or pure pigment stones. In addition to cholesterol and pigments, they also have varying amounts of calcium carbonate, phospholipids, mucopolysaccharide and mucoproteins.[7, 8] The chemical composition of gallstones may have significance with regards to the origin, clinical presentation and treatment.

Different techniques are used for the determination of chemical composition of gallstones. Such as Wet Chemical Method, X rays diffraction technique, FTIR spectroscopy, and Fluorescence Microscopy.[5, 9] A project was therefore undertaken using wet chemical method to study the chemical composition of gall stones in Riyadh, Saudi Arabia and to compare with the chemical composition of gall stones in some other geographic areas.

MATERIALS AND METHODS

The gall stones were sent to the central laboratory Riyadh by surgeons working in different hospitals in Riyadh region for chemical analysis. Analysis was done by wet chemical method. The stones were grinded in a mortar and a filtrate was obtained. The cholesterol contents in the stones were detected by enzyme assays and the bilirubin contents by Van den Berg reaction.

RESULTS

A total of 113 stones were chemically analyzed during one-year period from September 2000 to August 2001. The female to male ratio was 3.6:1. Seventy-eight (78%) percent patients were Saudis while 22% were Non-Saudis. The frequency and distribution of each stone type is shown in the table.

Table: Types, Number and Percentage of Gall Stones Studied

S. No.	Type of Stone	Number	Percentage
1	Mixed Stones	44	39%
2	Cholesterol stones	64	57%
3	Pigment stones	05	04%
Total	—	113	—

DISCUSSION

Gall stones remains a serious health concern affecting millions throughout the world.[10] It exhibit prevalence rates of about 25% in industrialized societies but are uncommon in underdeveloped or developing societies.[11]

The present work shows that in Riyadh, the central capital of Saudi Arabia, the cholesterol stones are predominant as compared to mixed and pigment stones. As shown in the table, 57% of the gallstones were of cholesterol variety. Our results are in conformity with the studies carried out in Korea, Germany, United States and Singapore.[11] It means that in Saudi Arabia like Western and other developing countries the incidence of cholesterol stones is high.

Factors that predispose to cholesterol hypersecretion are obesity, aging, diabetes mellitus and use of drugs like thiazides and oral contraceptives. Estrogenic influences including oral contraceptives and pregnancy, increase the expression of hepatic lipoprotein receptors and stimulate HMGCoA reductase activity. Thus both cholesterol level and biosynthesis are increased. From the above observations, it seems that the increased incidence of cholesterol stones in Saudi Arabia may be due to high fat diet. Again the custom of multiple marriages, multiple pregnancies and the use of oral contraceptives by the females may be responsible for the increased occurrence of gallstones in females. In this study the occurrence of stones in females was three and a half times more as compared to males.

Another interesting finding of this work was the gallstones were more common in Saudis (78%) as compared to non-Saudis. Many people from Pakistan, Philippines and India are working in Saudi Arabia in connections with various jobs. In these countries, particularly Pakistan, the occurrence of mixed stones (87%) is more as compared to cholesterol stones.[12] Obesity and diabetes mellitus are common in Saudi Arabia.[13] These factors may further contribute to the development of cholesterol stones in Riyadh.

Mixed stones are mixtures of insoluble calcium salts of unconjugated bilirubin with inorganic calcium salts. Indirect bilirubin is normally a minor component of bile but increases when infection of the biliary tract leads to release of microbial ^{2}-glucoronidases. Thus infection with E. coli, Ascaris lumbricoides or liver fluke in Asia, increases the likelihood of pigment stone formation. This may explain the higher incidence of mixed stones in Pakistan (87%), Syria (72.4%) and India (56.5%).[13] The relatively decreased incidence of mixed gall stones in Riyadh, Saudi Arabia may be due to better standards of hygiene in Saudi Arabia.

Pure pigment stones constituted 5% of the total gallstones. It has been found by some workers that cirrhosis is strongly associated with pigment gallstones.[11] As alcohol intake is prohibited and there is energetic blood screening and vaccination program against hepatitis B in Saudi Arabia, these conditions may not be responsible for pure pigment stone pathogenesis. Glucose-6-phosphate dehydrogenase deficiency is prevalent in central region of Saudi Arabia.[13] This along with thalassemia, sickle cell anemia, malaria and hereditary spherocytosis may be responsible for pure pigment gall stone pathogenesis in this part of the world.

It is concluded that modifications in diet, changes in life style and prevention of inter family marriages may play a role on the preventive side regarding the occurrence of gall stone.

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