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Lipid Profile and Other Risk Factors in Prevalence of Cholelithiasis: A Review

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Abstract:

The objective of this review is to high light the risk factors of gall bladder stone formation. As it is a general gastrointestinal disease in developed as well as in developing countries approximately ten to fifteen percent of adult population suffering from this aliment. Majority of patient's showed severe abdominal pain, which leads to surgical interventions. Numerous other factors including certain diseases may play a key role in formation of stones. The major cause is reduced metabolism of bile acids, cholesterol and bilirubin. In the case of cholelithiasis, the serum lipid profile plays a significant role especially in formation of cholesterol gallstones. The studies of 30 years indicated that the lipid disturbance noticed in half of the patients of

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cholelithiasis. This condition could increase the chance of stroke and coronary heart disorders. Evidences from previous studies suggest that cholelithiasis is more common in females than male. In several studies, eighty percent of females are effected with gall bladder stone disease. The synthesis of the bile acid decreases with the elderly age. However the findings of this study is to avoid fat rich food, regulate dyslipidemia, less use of saturated fatty acids, control of weight gain and assessment of lipid profile on shortly intervals and may be use of anti-hyperlipidemia drugs. Thus, these precautionary measures as well as medication may help in decreasing the formation of gall stone disease risk. Therefor the pharmaceutical companies must high light the importance of anti-lipedema drugs for treatment and prevention of cholelithiasis.

Key words: Gallstones; Risk factors; Serum lipid profile; Gender; Prevention.

Introduction:

Gall bladder stone is a general gastrointestinal disease. In developed countries about 10 to 15% of adult population suffering from this disorder. It's a substantial load to health care system because it is the one of the high prevalence gastrointestinal disease. Most of the patients of the gallstone do not show any symptom throughout the life. Majority of patient's shows severe abdominal pain which leads to surgical interventions (Lammert et al 2005; Conte et al 2011). Several other factors and diseases plays an important role in formation of gall bladder stone. The prime cause of gallstone is reduced metabolism of bile acids, cholesterol and bilirubin which categorized as development of stones in gallbladder (Ahmed et al 2015; Méndez et al 2005).

The stones are found in different compositions which varies from person to person, some of them are of cholesterol and some of them are pigmented or mixed stones (koppisetti et al 2008). The gallbladder stones have different colors depending on the composition of bile (Levy et al 2015). The gallstones are mostly hard having oval or round shaped usually found in bile duct or in gallbladder (Ahmed et al 2015). The gallstones stones are classified in three main classes on the basis of their chemical composition such as combined, pigmented and

cholesterol. Majority of gallbladder stones are form predominately of cholesterol while the pigmented stones contain sufficient amount of calcium rather than cholesterol. In case of mixed stones extra amount of cholesterol are present than that of pigmented stones (Ahmed et al 2015; koppisetti et al 2008; Levy et al 2015).

In the case of cholelithiasis the serum lipid profile plays a significant role especially in formation of cholesterol gall stones resulted in the changes in serum lipid profile (Koppisetti et al 2008). Now it is well established that change in the lipid profile is the basic incident in the pathogenesis of cholesterol stones. The change in lipid profile is due to high level of cholesterol secreted in bile by liver than that in normal conditions (McCallum et al 2014). Cholesterol makes vesicles and micelles because it's soluble in water. Cholesterol, bile salts and phospholipids accumulates to form micelles. Cholesterol combined with phospholipid bi layer to make round vesicles (Kumar et al 2014). The studies of thirty years indicated that the lipid disturbance noticed in half of the patients of cholelithiasis. This condition could increase the chance of stroke and coronary heart disorders (Khan et al 2009).

Evaluation of lipid profile:

The sera lipid profile is consider as an important factor in gall bladder stone disease (GSD). Previous studies suggest that metabolic syndrome is one of the cause of formation of gall stones because in this condition serum lipid is get changed (Cameron et al, 2004; Sikkandar et al, 2011). High levels of triglycerides and (HDL) high density lipoproteins low levels are related with cholelithiasis (Nayal et al; 2011).

It's also observed from previous studies that the patients suffering from cholelithiasis have high levels of serum cholesterol and triglyceride levels, it is may be due to abnormality in bile function. Bile acids and phospholipids which helps in digestion of cholesterol (Channa et al 2010). Presence of gallstones in gall bladder may disturb the mechanism and secretion of the phospholipids and bile acids, such situations may rise the precipitation of cholesterol (Olokoba et al 2006).

The content of cholesterol is found high in cholesterol stones due to super saturation of cholesterol in bile. The changed in the lipid

metabolism can be the cause of the formation of the cholesterol gallstones such as hyperlipidemia IIa and IV increase the cholesterol content more than other lipids of bile comes from liver (kumar et al 2014).

Some patients of the gall bladder stone also suffering from metabolic syndrome like high levels of serum cholesterol, glucose intolerance, low level of HDL, increase level of LDL, hypertension and hyperinsulinemia, all of these symptoms shows that metabolic syndrome may also be the cause gall bladder stone disease (Guraya et al 2005; Hung et al 2011).

Some studies also indicates that decreased levels of the HDL can be seen in the patients of the gall bladder stone disease and LDL levels are increased, after cholecystectomy these values will back to normal (Zak et al 2007; Sun H et al 2009).

The LDL level is elevated in gall bladder stone patients it is may be because of intake of fatty acid rich diet for long period of time and may be due to irregular secretion functions (Zhao et al 1998). Inhibition of LDL-ApoB receptors in gene expression may depressed the regulation of LDL-ApoB receptors, it is also the one of reason of the elevation of LDL levels in serum (Hung et al 2011).

The previous studies observed that strong risk factor of gall bladder stone is hyperlipidemia. The way of living and dietary habits alternations are the powerful measures for inhibition of gall stone formation (Hung et al 2011; Tsai CJ et al 2005). Some studies also shows that the medicines utilized to treat dyslipidemia might be useful for treatment and inhibition of gall bladder stone disease (Zak A et al 2007). There is significance association between serum triglycerides and gallstone patients observed from previous experiments. It indicates that there is strong relation between hypertryglycemia and cholelithiasis (Völzke et al 2011; Kondo et al 2001).

Elevated levels of the LDL and low levels of the HDL are correlated with hypertriglycemia (Kondo et al 2001). Due to lipoprotein lipase the triglyceride is loses in small particles of LDL, the particles of the LDL are transformed as VLDL lipoproteins and they converted into dense and smaller particles, they also contain cholesterol esters (Hecht et al 2001).

There is a positive association in serum cholesterol and triglyceride levels with gallstone disease. It is mentioned in most of the studies that Lipid profile is correlated with cholelithiasis. Super saturation of the cholesterol is considered as a key factor and base of development of gallstones which is due to irregular secretion of bile from liver (Portincasa et al 2006). Elevated levels of cholesterol are not directly associated with development of gallstones although stones are formed due to super saturation of the cholesterol in bile and this mechanism is involved in cholesterol gallstones are formed in gall bladder (Portincasa et al 2006).

Gender:

Evidence from previous studies suggest that cholelithiasis is more common in females than male gender. Most of the studies eighty percent females are effected with gall bladder stone disease. Female gender is also the one of the risk factor for formation of gallstones, it is due to female sex hormone oestrogen effects the function of liver (Yusoff et al 2003). Oestrogen hormone raises the secretion of biliary cholesterol, it can also stimulate the lipoprotein receptors of liver and this may increases the hepatic cholesterol uptake at high level. This condition stops the synthesis of the chenodeoxycholic acid and assemble of chenodeoxycholic acid is lowered this is due to complete influence of oesterogen hormone raises bile cholesterol (Williams et al 2008).

In initial studies the results showed that menstrual cycle have no effect on cholesterol saturation. Bile is seems to be more saturated in females than males which is not explained yet by means of age and body weight. The treatment of oral contraceptive can also be the one of risk factor for development of gallstones (Guraya et al 2007).

The increased number of the pregnancies can also be the one of the cause of the development of gallstones. Progesterone hormone is more responsible for bile saturation than estrogen. In duration of second and third trimester of pregnancy bile become more saturated which considered as a basic cause. During pregnancy the volume of gall bladder is large and the rate of emptying is slow than that in non-pregnant females (Pundir et al 2001)

If we ignore the hormones effect on bile interactions, hormones may manipulate the gall bladder function too, it might

influence the secretion of biliary lipid and organ may lead to the cholecystitus (Kondo et al 2001). In case of pigmented stone the male and females are effected in the same way but in case of cholesterol stones the role of female hormones are different and complicated but effecting bile salts, cholesterol secretion in bile and also the function of gall bladder (Jaleel et al 2017).

Age:

The hepatic bile saturation of cholesterol increase with elderly age because of low activity of the cholesterol 7-αhydroxylase, the rate limiting enzyme for bile acid synthesis (Atman et al 2006). The synthesis of the bile acid decreases with the elderly age and the production of the bile cholesterol increases and saturation of cholesterol also increases in females as well as in males (Novacek et al 2006). The peak ages of the cholelithiasis is 41 to 50. There are rare patients of gallstone after 60 years it is might be due to half of the patients of sixty are weak applicants of anesthesia and surgery. The ratio of patients under sixty is high because this disease preferring patients at young age shows lesser antedated complications (Bartoli et al 2000). Twenty five percent of the children affected by cholelithiasis due to cardiac diseases and hemolytic diseases. Many studies clearly supports that gallstones are familiar in females and can affect them at all ages and very rare in children (Yusoff et al 2003).

Smoking:

The results of certain studies shows that the smoker patients shows significance increase in serum total cholesterol and triglyceride levels and low level of HDL due to smoking because it effects all organs of body (Jaleel et al 2017). The high level of total cholesterol and triglycerides increases the risk of developing gallstones in majority of cases. The smoking decreases good cholesterol of body and increases the bad cholesterol at extreme level. This condition can lead to risk of coronary heart diseases, cardiac arrest and stroke. The advantageous point is that when you stop smoking the bad cholesterol levels will decrease very quickly (Amin et al 2000). The HDL is associated with low blood pressure and also with lowering the chance of the blood vessels clotting, smoking reduces the HDL levels in blood which is not beneficial about health. Oxygen can't move in blood vessels easily due

to atherosclerosis (clotting in blood vessels), which finally leads to serious physical damage to body sometimes can cause death (Pundir et al 2001)

Diet:

Many researches show that the food in the form of fatty acids and carbohydrates is one of the cause of the high level of triglyceride in gallbladder stone subjects (Pamela et al 2008). The intake of large amount of fats rich food can increase the risk of the gallbladder stone development. (Ruhl et al 2000). There for the replacement of unsaturated fatty acids which is present in low-fat foods can decrease the risk of gallbladder stone development that will not affect the litthogenic index of bile. (Nasser et al 2007). Evidences from many studies shows that gallstones are formed due to abnormal normal metabolism of lipids especially in case of cholesterol stones (Nagaraj et al 2012)

Conclusions:

This review explained that the main factors of gall bladder stone diseases is the various levels of total cholesterol, LDL, triglycerides and low levels of HDL. This biochemical parameters makes a strong relationship between gall bladder stone disorders and fatty diet. This is the one of the risk factor for development of cholesterol gall stones. Female gender is also considered as a one of risk factor for development of gall stones than male due to female sex hormone estrogen which alter the cholesterol saturation in bile and gallstone is very rare in children. Majority of patients of gallbladder stone are above 40 because in elderly age saturation of cholesterol increases in bile which can cause formation of stones. Metabolic syndrome, diet, cardiovascular disease and obesity may be the risk factors for developing gallstones. Lots of the previous studies suggested that hyperlipidemia as a powerful factor for formation of gall stones. Dietary alterations and sanitary life style are helpful for inhibition of developing stones in gall bladder. The probability of gallstone occurrence can be reduced by regulate dyslipidemia, lesser use of saturated fatty diet, control of weight gain, consumption of anti-hyperlipidemia drugs and assessment of lipid profile, can help to prevent gallstone disease. It is further recommended that fat rich diet

may be avoid as well as to increase consumption of fruits vegetables that may control the serum cholesterol level in human beings.

Recommendations

The basic objective behind this review is to define the risk factors of the involved in development gallstones and its association with serum lipid profile. On the bases of this review dietary modifications can be helpful in management and inhibition of gall stone disease.

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Table 1: Comparative chart of serum lipid profile with (Mean± SD) with gender ratio

Biochemical Parameters (Mean±SD)	Völzke *et al* 2005 (mmol/l)	Al-Ardhi *et al* 2012 (mg/dl)	Batajoo *et al* 2013 (mg/dl)	Al-Atrakchey *et al* 2014 (mg/dl)	Mahammad Ashak *et al* 2015 (mg/dl)	Ibtisam *et al* 2016 (mg/dl)	Gill *et al* 2017 (mg%)	Singh *et al* 2018 (mg/dl)	Khan *et al* 2019 (mg/dl)
Total cholesterol	5.92 ±1.25	275.43 ±35.89	153.92 ±22.482	197.64 ±49.68	146.8 ±18.19	185.77 ±11.43	162.98± 32.89	168.06± 35.215	184.60± 37.65
TG		186.63 ±67.21	89.97 ±24.103	180.006 ±50.00	128.9 ±37.69	170.82 ±19.72	196.67± 92.83	133.28± 69.616	198.12± 48.40
HDL	1.41 ±0.45	43.83 ±7.75	41.92 ±3.397	46.78 ±11.062	40.28 ±5.253	27.23 ±9.93	43.28± 8.86	42.19 ± 10.145	29.54± 8.406
LDL	3.69 ±1.16	192.21 ±41.38	97.65 ±25.302	115.76 ±37.694	76.12 ±14.08	145.10 ±14.95	107.94± 20.44	96.52 ± 29.297	118.40± 23.96
VLDL		37.03 ±13.45	24.36 ±5.827	36.83 ±17.82	30.56 ±8.728		39.41± 67.88		
Male/Female Ratio		4/26	133 Females	16/88	12/38	11/54	18/32	5/49	4/46

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