

Fruits and Vegetable Consumption and Risk of Cholecystectomy in Young Women of Low Socioeconomic Status

Nabeela Faisal¹, Fauzia Jan², Rahat Rehman³, Lubna Aftab⁴, Anum Bilal⁵, Anam Waheed⁶

- ¹ Assistant Professor, Department of Biochemistry, University Medical & Dental College, Faisalabad Pakistan
Conception & design, Data collection, Preparation & analysis of results, Manuscript writing
- ² Assistant Professor, Department of Biochemistry, University Medical & Dental College, Faisalabad Pakistan
Review of literature, Proof reading,
- ³ Assistant Professor, Department of Biochemistry, University Medical & Dental College, Faisalabad Pakistan
Proof reading, Statistical analysis
- ⁴ Assistant Professor, Department of Biochemistry, University Medical & Dental College, Faisalabad Pakistan
Literature review, Authentication of references, Statistical analysis
- ⁵ Medical Officer, Prime Care Hospital, Faisalabad Pakistan
Discussion writing
- ⁶ Demonstrator, Department of Physiology, Aziz Fatimah Medical & Dental College, Faisalabad Pakistan
Results compiling

CORRESPONDING AUTHOR

Dr. Nabeela Faisal

Assistant Professor, Department of Biochemistry,
University Medical & Dental College, Faisalabad
Pakistan
Email: nabeela.faisal@tuf.edu.pk

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ABSTRACT

Background: Lifestyle & dietary habits with reduced intake of fruits, vegetables, and homemade food has increased the incidence of cholelithiasis in younger women of low socioeconomic class. **Objective:** To ascertain the occurrence of disease & subsequent cholecystectomy in young females of lower socioeconomic class, to highlight the importance of fruits & vegetable consumption in lowering the incidence of disease and to define the role of lipid abnormalities. **Study Design:** Cross-sectional design. **Settings:** Allied Hospital, Faisalabad Pakistan. **Duration:** Six months (Jan-June 2018). **Methods:** Sample size was 80; 50 patients 30 control. Diagnosis confirmed by USG. Data collection was done by questionnaire. Serum cholesterol & triglycerides were assayed by kit method. Statistical analysis was done using SPSS 17. **Results:** Outcomes generated mean value of 35.01 ± 5.437 SD for age. Out of 50 patients, 19 females were in the range of 25-35 years and 31 were in 36-45. The disease was found to be high in lower middle class. Decreased consumption of fruits & vegetables showed association with the disease but homemade food had no association. 14% patients had increased cholesterol level, 86% had normal levels. Increased TG level was seen in 56% patients whereas 44% patients had normal level. **Conclusion:** Gallstone incidence is rising in young females of low middle class. Increasing age, reduced intake of fruits, vegetables and homemade food has a very strong association with disease. Increased cholesterol and triglycerides was found to have no correlation.

Keywords: Young women, Fruits, Vegetables, Cholelithiasis.

INTRODUCTION

One of the most prevalent, expensive and worldwide disease among gastrointestinal problems is cholelithiasis, resulting in more than 7, 00,000 cholecystectomies, accounting for 6.5-billion-dollar cost annually in US alone. Additionally, prevalence of gallstone is generally considered to be rising in young adults as a result of lifestyle and nutritional changes. The disease devours a considerable burden to the systems involved in health care. Majority of the cases usually present without any marked symptoms.¹ Dyslipidaemia, high BMI, and the raised socioeconomic status have strong associated with gallstone disease in younger ages.² There is change in occurrence of gallstone disease region

wise. The prevalence in Western countries is from 7.9 % in men to 16.6 % in women. In Asians 3 to 15 %, non-existent in Africans, and approximately 4.21 to 11% in China.³ In Gujranwala, incidence of disease and subsequent cholecystectomy is higher in females as compared to males. The married cases showed higher incidence of gallstone disease.⁴ In a local study carried out in the department of surgery at Madina Teaching Hospital along with participation of University Medical and Dental College, Faisalabad, gallstone disease was found to be increasing in young adults especially males though complication rate was more in females.⁵ Changes in dietary habits with westernization of diet have affected a very large number of young female populations with gallstone disease. Upper and middle classes of younger

females have been found to be increasingly affected because of inactive lifestyle, westernized diet and urge for fast food. Young women belonging to low socioeconomic status are also increasingly being affected due to use of pesticides and sprays on fruits and vegetables and due to use of non-organic food. Result is increase in number of operative surgery (cholecystectomy). The operative surgery performed in young females is still a stigma in our society. Post-operative complications and mortality rate after surgery are still very high.⁶ Socioeconomic status (SES) is social and economic combined measure of work experience and social and economic position of an individual or family in comparison to others in the society. It is based on education, income, and occupation. While analysing a SES of a family, earners' education, the household income, and occupation are observed, as well as the combined income, whereas for SES of an individual, only their own powers are evaluated. However, SES is commonly used to represent (as a whole) an economic difference in the society.⁷ The factors causing cholesterol gall stone formation is categorized into four major groups. These are those which lead to super saturation of cholesterol, cholesterol precipitation and crystallization, impairment of gallbladder functions and impairment of enterohepatic circulation of bile acids.⁸ The gallstones can be classified into pure, composite, and mixed stones. They may be cholesterol stones, black pigment, brown pigment stones, and carbonate stones.⁹ Female gender, multiparity, use of contraceptive pills, diabetes, non-alcoholic fatty liver disease, low socioeconomic status, illiteracy, advancing age,^{10,11,12} high blood pressure, high C4 level, thyroid disease,¹³ positive family history, high BMI,¹⁴ dyslipidemia, smoking, reduced fiber diet, dieting, physical inactivity,¹⁵ intake of soft drinks and tea, junk food, low intake of vitamin C are strong risk factors for cholelithiasis.¹⁶ On the contrary, protective factors were vegetable proteins,¹⁷ coffee, increased intake of fats (especially monounsaturated), fiber, fish containing omega-3 fatty acids, olive-pomace oil, fruits, ascorbic acid (vitamin C), life style modification regarding exercise, sleep and diet.¹⁸⁻²⁰ High cholesterol, high TG and low HDL levels are strongly associated with disease.²¹ Some factors cannot be modified such as ethnicity, genetics, female gender and advancing age whereas some are modifiable e.g., physical activity, diet, obesity and rapid weight loss.²² During the productive years; the females have a strong association with gallstone disease and the ratio of stone formation is twice in women to men. After menopause, the incidence decreases in females.²³ Socioeconomic status (SES) is just an indirect pointer to other risk factors e.g., chronic medical condition and obesity. Inactive lifestyle increases the risk of formation of gallstone while physical activity inhibits the disease. Increased exercise (up to 30 minutes five times per week) is important to prevent symptomatic disease development in males.²⁴ There is an inverse

relationship between risk of cholecystectomy and fruit vegetable consumption in women but in contrast, no such association in males.²⁵ If BMI is adjusted, a significant statistically positive association is seen between symptomatic gallstone disease and vegetarian diet.²⁶

METHODS

This was a cross-sectional study conducted at Allied Hospital Surgery Department, Faisalabad Medical University, Faisalabad Pakistan. A period of six months from January-June 2018.

Total participants were eighty. Young females having age between twenty to forty-five years were included in the study. For the control group, selection criteria was females of younger age (20-45) of same socioeconomic status. 50 diagnosed cases of cholelithiasis were chosen. Participants were assured of full confidentiality regarding personal information after getting an informed consent. After getting permission of ethical review board of the institution (letter no. UMDC/RERC/2018/12); a questionnaire-based information was collected regarding demographic parameters, income, occupation, education, and intake of homemade food, fruits and vegetables. Serum cholesterol and triglycerides were assayed by kit method using automated analyzer. For Cholesterol estimation, kit used was of liquicolor Human Company with guidelines of literature (Thomas, L. 2012) and triglycerides were assayed by liquicolor mono kit of the same company with guide lines of literature (Schettler, G. and Nussel, E. 1975). For Statistical application, chi square test was done. SPSS version 17 was applied for analysis of data to find increased incidence of gallstones with reduced intake of fruits and vegetables & derangement in lipid profile. Less than 0.05 p value was considered as convincing.

RESULTS

Young females having age between 20-45 years in tertiary care setup were selected. 50 cases of cholelithiasis were included. Diagnosis was done on ultrasonography.³⁰ control from same socioeconomic back grounds were selected. The study duration was of six months. Results indicated mean value of age 35.01 ± 5.437 SD (standard deviation). This showed occurrence of disease is maximal during 30-40 years of age.

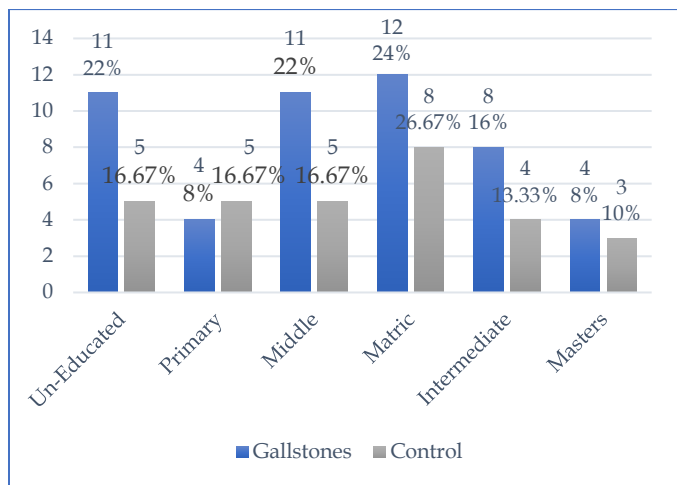
For lipid profile levels, National Cholesterol Education Program (NCEP) was considered as given below.²⁷

	Desiable	Borderline	High risk
Cholesterol	< 200 mg/dL	200-239 mg/dL	240 mg/dL
Triglycerides	< 150 mg/dL	150-199 mg/dL	200-499 mg/dL
HDL Cholesterol	60 mg/dL	35-45 mg/dL	<35 mg/dL
LDL Cholesterol	60-130 mg/dL	130-159 mg/dL	160-189 mg/dL
Cholesterol/HDL ratio	4	5	6

Table 1: Descriptive statistics of demographic variables

Variables	n	Minimum Value	Maximum Value	$\bar{x}\pm SD$
Age	80	25	45	35.01±5.437
Income	80	6000	60000	26125.00±15584.295

Figure 1: Application of chi square test for analysis of education with gallstone disease



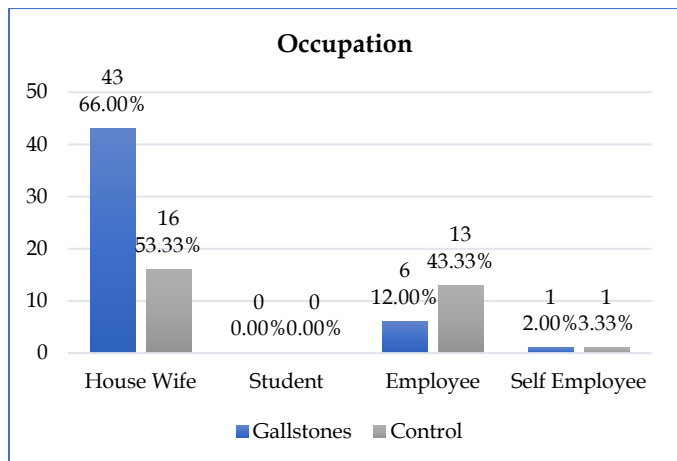
Results are; p -value = 0.847 Chi-square value = 2.01

Table 2: Socioeconomic status analysis with gallstone disease applying chi square test

Socio economic status	Group		Total
	Cases	Control	
Lower	11	7	18
	22.0%	23.3%	22.5%
Lower middle	25	13	38
	50.0%	43.3%	47.5%
Upper middle	14	10	24
	28.0%	33.3%	30.0%
Total	50	30	80

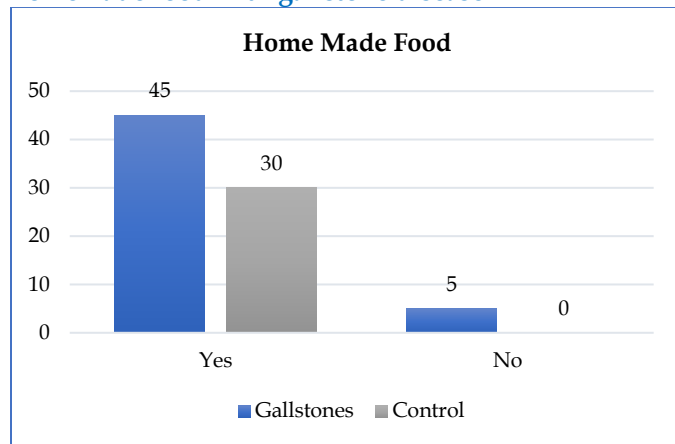
p -value = 0.832, Chi-square value = 0.368

Figure 2: Application of chi square test for analysis of occupation with gallstone disease



Results are; Chi-square value = 10.59, p -value = 0.005

Figure 3: Application of chi square test for analysis of homemade food with gallstone disease



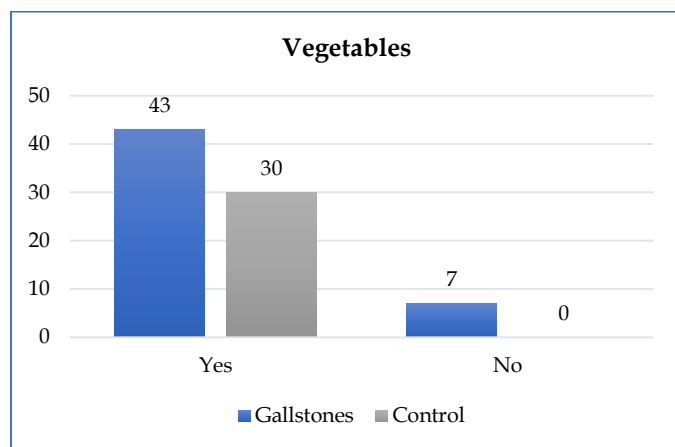
Chi-square value = 3.2, p -value = 0.074

Table 3: Chi square test application for analysis of fruits with gallstone disease

Fruit	Group		Total
	Cases	Control	
Yes	21	20	41
	42.0%	66.7%	51.2%
No	29	10	39
	58.0%	33.3%	48.8%
Total	50	30	80

Chi-square value = 4.56, p -value = 0.033

Figure 4: Application of chi square test for analysis of vegetables with gallstone disease



Chi-square value = 4.6, p -value = 0.032

Table 4: Lipid profile; Descriptive statistics

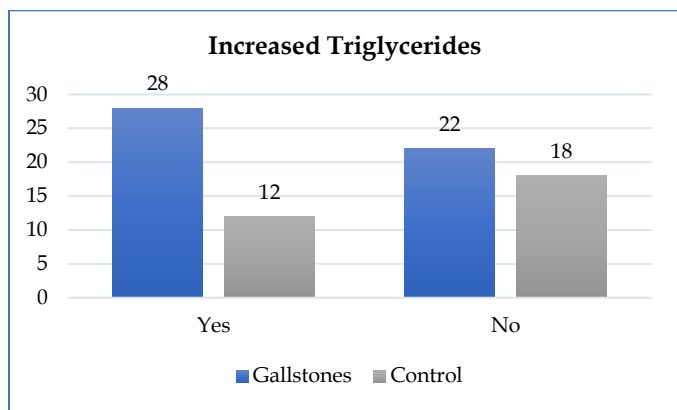
Variables	n	Maximum Value	Minimum value	$\bar{x}\pm SD$
Triglycerides	80	294	56	161.66±60.995
Cholesterol	80	240	101	167.85±27.275

Table 5: Analysis of Correlations of cholesterol level with gallstone disease applying chi square test

Increased cholesterol	Group		
	Control	Cases	Total
Yes	3	7	10
	10.0%	14.0%	12.5%
No	27	43	70
	90.0%	86.0%	87.5%
Total	30	50	80

p-value = 0.6, Chi-square value = 0.274

Figure 5: Application of chi square test for analysis of triglycerides with gallstone disease



p-value = 0.166, Chi-square value = 1.92

DISCUSSION

The data shows that gallstones are common in uneducated and under matric females. Considering the education as a parameter of assessing socioeconomic status, the gallstone disease was found to be prevalent in lower SES. The incidence was found to be maximum in lower middle class; considering lower, upper middle & upper classes, the association of socioeconomic status with the disease is not significant. Considering occupation as a parameter of assessing SES, the diseases is prevalent in-house wives (lower socioeconomic class). These findings are consistent with the previous studies (Balakrishnan et al, 2022, Naeem et al, 2012).^{12,13} There is no association of the disease with use of homemade food. This is contrary to study by Naeem et al, (2012).¹³ This study shows decreased consumption of fruits is associated with the disease i.e; fruit consumption is inversely related with the disease, same as study by Zhang et al 2019.¹ The results are contrary to the study performed by Norden all et al, 2016.²⁶ The data shows vegetable consumption has inverse relationship with gallstones. Previous studies (Zhang et al 2019, Lander et al 2016, Mousa & Abdul Ridha 2016, and Nordenvall et al, 2016)^{1,18,19,26} showed reduced occurrence of gallstones in vegetable consumers. McConnell et al, 2017 showed that non vegetarian diet is a risk factor in causation of gall stone diseases.²⁸ The data shows high cholesterol has no

association with the disease, same as in study done by Shrestha et al, (2012)⁶ but different from studies carried out by (Harish 2014, and Aly et al, 2023) which strongly advocated the association of high cholesterol gallstones.^{16,29} Raised triglyceride level has no role in causation of gallstones. Very strong association seen in previous studies (Shrestha et al, 2012, Siddiqua et al, 2024).^{6,22}

CONCLUSION

This study suggests that the incidence of cholelithiasis is inversely related with fruits and vegetable intake. Homemade food has no association with the disease. Gallstone disease is prevalent among house wives of low socioeconomic background. Increased cholesterol and triglycerides show no correlation with cholelithiasis. Healthy and balanced diet which including fruits and vegetables can reduce the risk of this disease. This disease is quite prevalent in younger females of our society with lower socioeconomic background. The reduction of the occurrence of the disease can help to reduce the economical load on our healthcare system. A number of studies performed by different researches have proved that genetic, metabolic, environmental, and related domains have been related with gallstone formation. Advancing age and female sex are still important components which cannot be altered. However, diet selection can be a variable risk feature to avoid gallstone disease. Result is finding of relationship between fruits and vegetables intake and the gallstone disease in providing the fortuity to lower the development of this disease. It can also provide a healthier approach for the physicians while prescribing diet to subjects having a high risk of gallstones. As majority of the cases are asymptomatic, dietary management can help such patients. In future this study may be done on a larger scale including middle aged and elderly female, male in both public and private hospitals.

LIMITATIONS

This study has been done in one public sector hospital. Female patients were included in the study. Duration is only six months. Most of the patients who present in public hospitals belong to poor or middle socioeconomic status. Future studies addressing these limitations can give a broader view of the risk factors for cholelithiasis.

SUGGESTIONS / RECOMMENDATIONS

Public awareness should be done in order to modify the diet and to motivate the people to avoid junk/ unhealthy food. Special emphasis needs to be put in at the level of schools and colleges and steps should be taken at administrative level to stop selling unhealthy/ junk food in canteens and tuck shops.

CONFLICT OF INTEREST / DISCLOSURE

There is no conflict of interest.

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REFERENCES

- Zhang JW, Xiong JP, Xu WY, Sang XT, Huang HC, Bian J, Xu YY, Lu X, Zhao HT. Fruits and vegetables consumption and the risk of gallstone disease: A systematic review and meta-analysis. *Medicine*. 2019 Jul 1;98(28):e16404.
- Reshetnyak VI. Concept of the pathogenesis and treatment of cholelithiasis. *World journal of hepatology*. 2012 Feb 2;4(2):18.
- Nasir A, Zulfiqar T, Ali A, Zafar H. Prevalence of Gallstone Disease and its Correlation with Age among People Undergoing Abdominal Ultrasound in Gujranwala. *EASJ Radiol Imaging Technol*. 2021;3(3):142-5.
- Hayat N, Duja B, Ahmad T, Rehan A. To determine the importance of age and sex in the clinical presentation and subsequent outcome in cholelithiasis. *JUMDC*. 2013;4(1):36-41.
- Shrestha KB, Dahal P, Shah LL, Singh R. Relation of lipid profile, BMI and cholelithiasis in Nepalese population. *PMJN*. 2012;12(1):40-.
- [https://www.apa.org/pi/ses/resources/publications/education#:~:text=Socioeconomic%20status%20\(SES\)%20encompasses%20not,afforded%20to%20people%20within%20society](https://www.apa.org/pi/ses/resources/publications/education#:~:text=Socioeconomic%20status%20(SES)%20encompasses%20not,afforded%20to%20people%20within%20society).
- Parviainen A, Suárez-Grau JM, Pérez-López R, Nieto JM, Garrido CJ, Cobo-Cárdenas G. Combined microstructural and mineralogical phase characterization of gallstones in a patient-based study in SW Spain-Implications for environmental contamination in their formation. *Science of the Total Environment*. 2016 Dec 15;573:433-43.
- Goktas SB, Manukyan M, Selimen D. Evaluation of factors affecting the type of gallstone. *Indian journal of surgery*. 2016 Feb;78:20-6.
- Nimanya S, Ocen W, Makobore P, Bua E, Ssekitooleko B, Oyania F. Prevalence and risk factors of gallstone disease in patients undergoing ultrasonography at Mulago hospital, Uganda. *Afr Health Sci*. 2020 Mar;20(1):383-391.
- Lu Y, Hu L, Song J, Wan J, Chen H, Yin J. Gallstone disease and nonalcoholic fatty liver disease in patients with type 2 diabetes: a cross-sectional study. *BMC Endocr Disord*. 2021 Nov 19;21(1):231.
- Balakrishnan G, Iqbal T, Uppinakudru G, Fernandes R, Bangera S, Dutt RA. The impact of lifestyle stressors, menstrual pattern, and cardiometabolic risk factors on young females with cholelithiasis. *J Educ Health Promot*. 2022 Aug 25;11:255.
- Naeem M, Rahimnadjad NA, Rahimnadjad MK, Khurshid M, Ahmed QJ, Shahid SM, Khawar F, Najjar MM. Assessment of characteristics of patients with cholelithiasis from economically deprived rural Karachi, Pakistan. *BMC research notes*. 2012 Dec;5:1-8.
- Song ST, Shi J, Wang XH, Guo YB, Hu PF, Zhu F, Zeng X, Xie WF. Prevalence and risk factors for gallstone disease: A population-based cross-sectional study. *J Dig Dis*. 2020 Apr;21(4):237-245.
- Bilal M, Haseeb A, Saad M, Ahsan M, Raza M, Ahmed A, et al. The prevalence and risk factors of gallstone among adults in Karachi, south Pakistan: A population-based study. *Global Journal of Health Science*. 2016 Aug 10;9(4):106.
- Harish B. A cross sectional study on causes and risk factors of gallstone disease among patients with symptomatic Cholelithiasis. *International Journal of Nursing Research and Practice*. 2014;1(1):20.
- Sheng B, Zhao Q, Ma M, Zhang J. An inverse association of weight and the occurrence of asymptomatic gallbladder stone disease in hypercholesterolemia patients: a case-control study. *Lipids in Health and Disease*. 2020 Dec;19:1-0.
- Lander EM, Wertheim BC, Koch SM, Chen Z, Hsu CH, Thomson CA. Vegetable protein intake is associated with lower gallbladder disease risk: Findings from the Women's Health Initiative prospective cohort. *Preventive medicine*. 2016 Jul 1;88:20-6.
- Mousa AM, Abdul Ridha JJ. Risk Factors of Patients with Cholelithiasis in a Sample of Baghdad Teaching Hospitals. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*. 2016;15(1):50-4.
- Nimanya S, Ocen W, Makobore P, Bua E, Ssekitooleko B, Oyania F. Prevalence and risk factors of gallstone disease in patients undergoing ultrasonography at Mulago hospital, Uganda. *African Health Sciences*. 2020 Apr 20;20(1):383-91.
- Jahantab MB, Safaripour AA, Hassanzadeh S, Yavari Barhaghtalab MJ. Demographic, chemical, and helicobacter pylori positivity assessment in different types of gallstones and the bile in a random sample of cholecystectomized iranian patients with cholelithiasis. *Canadian Journal of Gastroenterology and Hepatology*. 2021;2021(1):3351352.
- Siddiqi A, Khan S, Rafiq M, Hanif F, Anwer MS, Khattak A. The Association of Dyslipidemias with Cholelithiasis: A Case-Control Study Conducted at Pakistan Institute of Medical Sciences (PIMS), Islamabad. *Life and Science*. 2024 May 5;5(2):166-71.
- Tehrani AN, Saadaati S, Yari Z, Hekmatdoost A. Dietary fiber intake and risk of gallstone: *BMC Gastroenterology*. April 2023 23(119):1-8.
- Compagnucci B, Agustina A, Perroud & Stella, M & M, Pezzotto. Foods and nutrients consumption and the risk of gallstone disease: *Archives of Preventive Medicine*. Jan 2024. 9(1): 008-017.
- Banim PJ, Luben RN, Wareham NJ, Sharp SJ, Khaw KT, Hart AR. Physical activity reduces the risk of symptomatic gallstones: a prospective cohort study. *Eur J Gastroenterol Hepatol*. 2010 Aug;22(8):983-8.
- Nordenvall C, Oskarsson V, Wolk A. Fruit and vegetable consumption and risk of cholecystectomy: a prospective cohort study of women and men. *Eur J Nutr*. 2018 Feb;57(1):75-81.
- <https://i0.wp.com/ptmasterguide.com/wp-content/uploads/2019/11/b5f71133e97cb2d01fcd97a4fb7f5da728466479670028362740.jpg?resize=494%2C343&ssl=1>
- McConnell TJ, Appleby PN, Key TJ. Vegetarian diet as a risk factor for symptomatic gallstone disease. *Eur J Clin Nutr*. 2017 Jun;71(6):731-735.
- Aly DM, Fteah AM, Al Assaly NM, Elashry MA, Youssef YF, Hedaya MS. Correlation of serum biochemical characteristics and ABCG8 genetic variant (rs 11887534) with gall stone compositions and risk of gallstone disease in Egyptian patients. *Asian J Surg*. 2023 Sep;46(9):3560-3567.