

# Body composition, metabolic dysregulation, and inflammatory responses in premenopausal and postmenopausal women with gallstones: a cross-sectional analysis

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## ABSTRACT

**Background.** Gallstone disease is a prevalent hepatobiliary disorder, with a particularly high incidence in postmenopausal women. Hormonal, dietary, oxidative, and inflammatory pathways contribute to its pathogenesis.

**Objective.** To evaluate the influence of menopause on anthropometric measures, lipid and glucose metabolism, inflammatory markers, and oxidative stress indicators in women with gallstones compared with healthy controls.

**Methods.** This observational study included 180 women divided into four groups: premenopausal with gallstones ( $n = 50$ ), postmenopausal with gallstones ( $n = 50$ ), healthy premenopausal ( $n = 40$ ), and healthy postmenopausal ( $n = 40$ ). Anthropometric, metabolic, inflammatory, oxidative and hormonal parameters were assessed.

**Results.** Metabolically the FBG and lipid profile increased in all patients, LDL elevated in post menopause, while HDL was reduced in premenopausal patients. Inflammatory markers (CRP, IL-6, PCT) were elevated in all gallstone patients. Oxidative stress marker MDA was also increased, especially in premenopause patient. Estradiol levels declining as expected postmenopause.  $\gamma$ -GT, resistin, insulin, and GLP-1 were elevated in gallstone patients, while CCK decreased in premenopausal patients

**Conclusion.** Gallstone disease is associated with increased adiposity, dyslipidemia, inflammation and oxidative stress. Menopause-related hormonal changes, particularly the decline in estrogen, appears to exacerbate these factors. These findings highlight the importance of anthropometric and inflammatory markers for risk assessment across menopausal stages.

**Keywords:** cholelithiasis, anthropometric measurements, estrogen, GLP-1, menopause, inflammation

## INTRODUCTION

Gallstone disease, or cholelithiasis, is a significant global health concern, affecting approximately 10–20% of adults. Women are disproportionately affected, particularly during menopause, due to complex interactions among genetic, hormonal, metabolic, and environmental factors that influence bile composition and

gallbladder function [1,2]. Estrogen exerts a protective role during reproductive years by regulating hepatic lipid metabolism and bile acid production, thereby reducing cholesterol crystallization and gallstone formation [3,4]. It also modulates hepatic transporters such as ABCG5 and ABCG8, and its decline results in bile that is more lithogenic [5]. Furthermore, estrogen enhances gallbladder responsiveness to cholecystokinin, support-

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