Serum cholesterol profile in children with celiac disease and effect of gluten free diet

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Abstract

Background: various researchers have shown association of celiac disease with altered lipid profile. We studied serum cholesterol levels in patient with celiac disease and effect of gluten free diet on it. This study aims to compare the serum cholesterol levels in celiac disease patient with general population and to study effect of gluten free diet on serum cholesterol in them.

Methods: 50 children with celiac disease (either newly diagnosed or having poor dietary compliance for gluten free diet) and 50 healthy children were enrolled. Their serum cholesterol levels were collected and compared. After 6 months of strict gluten free diet, serum cholesterol levels for celiac patients were measured and compared with the previous levels.

Result: mean serum cholesterol in patients with celiac disease was significantly lower (16.78%) than the healthy children ($p<0.001$). Boys with celiac disease had 13.07% and girls with celiac disease had 21.34 % lower mean serum cholesterol when compared to their healthy peers. The difference between both sexes was significant. After 6 months of strict gluten free diet, celiac patients showed 22.87% increase in their serum cholesterol. Boys had 15.03% and girls had 24.81% increase in their serum cholesterol. These levels were significantly higher than those measured at the start of therapy and comparable to their healthy peers.

Conclusion: hypocholesterolemia is significantly associated with celiac disease. Gluten free diet significantly increases serum cholesterol levels in the range comparable to healthy population. The serum cholesterol levels were not found to be abnormally high suggesting that gluten free diet should not adversely affect cardiovascular health in long term.

Key words: Celiac disease, Serum Cholesterol, Gluten free diet, Bikaner

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Introduction

Celiac disease is genetically determined, immune mediated, chronic inflammatory multisystem disorder triggered by gluten exposure to the intestine.[1] Manifestation of the disease result from decreased absorption of various nutrients leading to abnormal metabolic status including altered lipid profile. Ciacci et al and West et al.[2,3] have suggested association of hypocholesterolemia with celiac disease. This lead to concerns if treatment of celiac disease could adversely affect the cardiovascular health in the long term by raising their serum cholesterol levels to the unsafe levels. The low serum cholesterol levels in celiac disease were not found to be associated with decreased risk of IHD or stroke.[4] In fact, celiac disease has been paradoxically associated with increased risk of ischaemic stroke and heart disease by some.[5,6]

In this study, children with celiac disease were evaluated for their serum cholesterol levels and assessed for the effect of gluten free diet on that, assuming that knowledge of serum cholesterol levels during the course of celiac disease might help in predicting the status of cardiovascular health in these patients. Although, long term prospective studies are required for the same.

Material and Methods

This study was carried in a tertiary care hospital of north western Rajasthan. Ethical committee approved our study. A total of 50 children of either gender, below 16 years of age, diagnosed with celiac disease (newly diagnosed or having poor compliance for gluten free diet) were enrolled in this study. Celiac disease was diagnosed with the help of serum IgA-tTG levels and duodenal biopsy. Children with any other chronic metabolic (Diabetes, hyper/hypothyroidism, liver disease etc.) or severe medical illness were excluded from cases. Another 50 apparently healthy children of either gender and below 18 years were identified as control group. Information regarding their age, sex, mode of presentation (for cases), duration of symptoms and anthropometry was collected. A case of celiac disease was considered newly diagnosed if interrogated within a month of diagnosis. Dietary compliance was assessed by questioning in detail about their dietary

history. Fasting total serum cholesterol was measured for both cases and controls. All celiac disease patients were counselled for strict gluten free diet (GFD) and maintenance of the same was assured by timely follow up. After 6 months of strict gluten free diet, fasting total serum cholesterol levels were repeated for cases. Collected data was tabulated and stastically analysed by using SPSS software.

Result

Out of 50, there were 30 males and 20 females in the study group. Control group had 28 males and 22 females. Mean serum cholesterol, at first interrogation, of the celiac patients was 127.72±25.02 which was 16.78% lower than that observed in the control group (153.48+16.21). The difference between both groups was highly significant. Males with celiac disease had mean serum cholesterol 133.63±26.31which was 13.07% lower than their non-celiac controls. Serum cholesterol in females with celiac disease was 118.85±23.82 which was 21.34% higher than females in the control group. The difference was significant in both the groups (p=<0.0001)[Table 1]. The mean serum cholesterol of celiac patients after 6 months of strict gluten free diet was 21.87% higher than their previous mean level. Serum cholesterol increased by 15.03% in males and 24.81% higher in females. The increase was statistically significant in both males and females[Table 2]. The mean serum cholesterol levels after 6 months of strict gluten free diet were comparable to the control group as the difference between both groups were statistically insignificant (p=0.111)[Table 3]. The difference of mean cholesterol levels were in significant between males and females both at initial interrogation as well as after 6 months of gluten free diet.

Table 1: Mean serum cholesterol in celiac and Control group (first visit)

Fasting total serum cholesterol	Celiac Patients (n=50)		Control group (n=50)		T	P
	Mean	SD	Mean	SD		
total	127.72	25.02	153.48	16.21	6.110	0.0000
males	133.63	26.31	153.90	20.34	4.310	0.0000
females	118.85	23.82	152.90	18.45	7.991	0.0000

Table 2: Serum cholesterol in celiac disease patients before and after GFD at 6 months follows up

Fasting total serum cholesterol	Before GFD		After GFD (6 months)		T	P
	Mean	SD	Mean	SD		
Total	127.72	25.02	159.23	19.93	6.970	0.000
Males	133.63	26.31	158.89	20.06	5.399	0.000
Females	118.85	23.82	151.05	19.54	7.390	0.000

Table 3: Comparison of mean serum cholesterol in celiac disease patients after GFD for 6 months with control group

Fasting total serum cholesterol	celiac disease patients after GFD for 6 months		Control group		T	P
	Mean	SD	Mean	SD		
Total	159.23	19.93	153.48	16.21	1.606	0.111
Males	158.89	20.06	153.90	20.34	0.017	0.986
Females	151.05	19.54	152.90	18.45	0.483	0.628

Discussion

The present study shows that at diagnosis celiac patients have much lower total cholesterol levels (16.78%) than the controls with the observed reduction greater in men (13.07%) than in women (21.34%). The present study observed increase in total cholesterol on treatment with a gluten-free diet. This may occur possibly due to Intestinal malabsorption, reduced cholesterol genesis, increased biliary secretion and/or high faecal elimination of cholesterol have all been proposed as mechanisms which might lower total cholesterol in people with celiac disease in comparison to the control group[7-9]. According to other study by E. Rosenthal et al[10], no significant differences were found between cholesterol level in celiac and control group. Study by West et al[3], who found total cholesterol levels were 10% lower in endomysial antibody-positive people in comparison to endomysial antibody-negative general population controls. In contrast, in a study by Gilbert et al[11]. Cholesterol levels were found to be significantly lower than in controls.

In 24 untreated adults with CD, Vuoristo et al[9] found serum cholesterol levels of 178 mg, versus 201 mg in controls. In a study by Nina R. Lewis et al[12], At diagnosis of celiac disease, men had 21% lower and women had 9% lower mean total cholesterol in comparison to the general population. The present study shows that, at 6 months follow up statistically significant increases in mean Serum total Cholesterol levels in celiac patients who were following strict GFD. After 6 months of strict gluten free diet, celiac patients showed 22.87% increase in their serum cholesterol. Boys had 15.03% and girls had 24.81% increases in their serum cholesterol. These levels were significantly higher than those measured at the start of therapy and comparable to their healthy peers. In contrast, Brar et al.[13] observed a 0·5 mmol/l (11%) increase in total cholesterol despite similar proportions of men and women in the cohort, and similar proportions of partial to total villous atrophy present on duodenal biopsy at diagnosis. This is probably a reflection of differences in the study populations. According to study by Lorenzo norsa et al[14], found significant increases in both total cholesterol and HDL cholesterol in patients on a GFD. Various Gastrointestinal and Extra intestinal manifestation of celiac disease patients with hypocholesterolemia were significantly observed in celiac patients with hypocholesterolemia. In celiac patients, gluten causes histological alterations of the small bowel that may lead to disturbances in nutrient absorption and symptoms. The treatment of celiac disease consists of a life-long gluten-free diet to heal the duodenal mucosa, improve symptoms, and protect against development of complications.

Conclusion

Hypocholesterolemia is significantly associated with celiac disease. Gluten free diet significantly increases serum cholesterol levels in the range comparable to healthy population. The serum cholesterol levels were not found to be abnormally high suggesting that gluten free diet should not adversely affect cardiovascular health in long term.

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