

## Analysis of Serum Lipid Profile in Benign Prostatic Hyperplasia Patients and Control Subjects

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### Abstract

The relationship between serum lipid profile and symptomatic benign prostatic hyperplasia (BPH) was investigated. All the participants had undergone a urological investigation. Comparisons of serum lipid levels between BPH patients and controls (without BPH) were done. In this study, The mean age of patients in both groups was similar. The results showed that BPH cases had significantly higher levels of total cholesterol ( $205.99 \pm 16.44$ ) and LDL ( $137.42 \pm 17.77$ ) when compared to the control group. The study suggested a correlation between lipid profile and prostate enlargement in BPH, indicating a potential link between cholesterol and BPH pathophysiology. However, further research is needed to understand the exact mechanism behind this relationship.

### INTRODUCTION

BPH has been variably defined as prostatic enlargement, histologic hyperplasia, lower urinary tract symptoms, diminished uro-flow or uro-dynamic obstruction. BPH has a negative impact on daily life and if left untreated, serious life threatening complications may arise. It is a chronic, progressive and highly prevalent disease, posing a socioeconomic burden to the patients (Parsons et al., 2008). Numerous research studies have consistently indicated that men who are obese have an increased likelihood of developing benign prostatic hyperplasia (BPH). Various criteria, such as patients' BMI and waist circumference, have been employed to establish standards for diagnosing obesity based on individual characteristics. Across all these studies, a consistent consensus has been reached, demonstrating that both central (abdominal) and general (overall) Obesity raises the risk of BPH and contribute to the worsening of urinary symptoms (Parkesit et al., 2016).

Obesity is a severe condition linked to elevated levels of serum lipids, such as Triglycerides, low-density lipoproteins (LDL), overall cholesterol, as well as low amounts of high-density lipoproteins (HDL). If obesity or

a diet rich in fatty foods raises the likelihood of developing BPH, high levels of serum lipids could potentially serve as indicators of benign prostatic enlargement. Lowering these lipid levels to normal values may help in managing BPH (Lekili et al., 2006). The occurrence of benign prostate hyperplasia (BPH) significantly increases with advancing age. BPH is observed in 70% of men in the United States aged between 60 and 69, while the figure rises to 80% for those aged 70 or above. Between 1994 and 2000, both the incidence and the prevalence of BPH elevated slowly in the US. (Parsons J.K., 2010).

In India, approximately half of men aged 60 or above are affected by benign prostatic hyperplasia (BPH). Several studies conducted in India have shown that the prevalence of BPH ranges from 25% to 50% across different age groups. Specifically, prevalence percentages between the ages of 40 and 49, 50 to 59, 60 to 69, and 70 to 79 are approximately 25%, 37%, 37%, and 50% respectively.

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This means that by the time men reach the age of 60, more than 50% of them will have some signs of the condition. On a global scale, the prevalence of BPH in men over 50 years old generally ranges from 20% to 62% (Bhat et al., 2021).

In older men, having BPH is directly related to the development of lower urinary symptoms (LUTS) that have a variety of symptoms. Changed lipid metabolism has been reported in enlarged prostate but there are not a great number of studies investigating the association between serum lipid profile in BPH cases and their association with prostate size.

## MATERIALS AND METHODS

This study was carried out in the department of Biochemistry, Integral Institute of Medical Sciences & Research, Lucknow. 30 BPH patients and 30 controls subjects were taken for the study.

### Inclusion Criteria

Diagnosed cases of BPH patients and apparently healthy control subjects with age of 40 years and above.

### Exclusion Criteria

BPH patients with neurogenic bladder dysfunction, 5-alpha reductase inhibitor therapy and liver disease were excluded from the study.

### Collection of Sample

Under the aseptic condition, 3 ml of venous blood was collected in the red top (plain vial) from the subjects. 1 ml of blood was taken for the determination of serum total cholesterol. 1 ml of blood was taken for the determination of serum triglycerides. 1 ml of blood was taken for the determination of serum high density lipoprotein (HDL). LDL was calculated by using formula-  $LDL-C (mg/dl) = TC (mg/dl) - HDL-C (mg/dl) - TG (mg/dl)/5$ .

**Table 1.** Clinical parameters of study groups

| Parameters        | BPH (n=30)     | Control (n=30) | p-value       |
|-------------------|----------------|----------------|---------------|
| Age               | 50.66± 6.69    | 50.4± 3.78     | 0.853         |
| BMI               | 27.53 ± 3.72   | 27.43 ± 3.54   | 0.915         |
| Total cholesterol | 205.99 ± 16.44 | 188.37 ± 19.07 | <b>0.0003</b> |
| Triglyceride      | 161.65 ± 38.35 | 119.99 ± 34.79 | <b>0.0001</b> |
| HDL-C             | 35.39 ± 3.13   | 37.20 ± 3.03   | <b>0.0268</b> |
| LDL-C             | 137.42 ± 17.77 | 126.38 ± 18.94 | <b>0.0234</b> |

### Sample Storage

Samples were stored at -20°C at the central clinical laboratory for further examination.

## METHOD

Total cholesterol was estimated by modified Roeschlau's method & the absorbances are read at 505 nm on bichromatic auto analyzer. Triglyceride was estimated by Wako and the modifications by McGowan and Fossati & the absorbances are read at 505 nm on bichromatic auto analyzer. HDL-C is based on a modified polyvinyl sulfonic acid (PVS) and polyethylene glycol-methyl ether (PEGME) coupled classic precipitation method with the improvements in using optimized quantities of PVS/PEGME and selected detergents. LDL-C is based on a modified polyvinyl sulfonic acid (PVS) and polyethylene glycol methyl ether (PEGME) coupled classic precipitation method with the improvements in using optimized quantities of PVS/PEGME and selected detergents.

### Statistical Analysis

Statistical analysis was performed using IBM-SPSS software (version 16), Graph Pad (Prism 6.0) and Microsoft – Excel (version 2013). All the data were expressed as mean ± standard deviation. An unpaired t-test was performed to compare the study parameters between cases and controls. Karl Pearson's correlation analysis was employed to determine the relationship between variables. p-value <0.05 was considered statistically significant.

## RESULT

A total of 30 subjects were enrolled in this case control study. The result of statistical analysis have been summarized in the Table 1 shows the comparison of clinical parameter between the study groups. According to statistical analysis there was a significant correlation between total cholesterol & LDL-C. However, it was found

that levels of total cholesterol and LDL-C was raised significantly in cases as compared to controls ( $p=0.0003$  and  $p=0.0234$  respectively) (Figure 1). Table 2 shows

Pearson's correlation between variables in subjects with pregnant women.

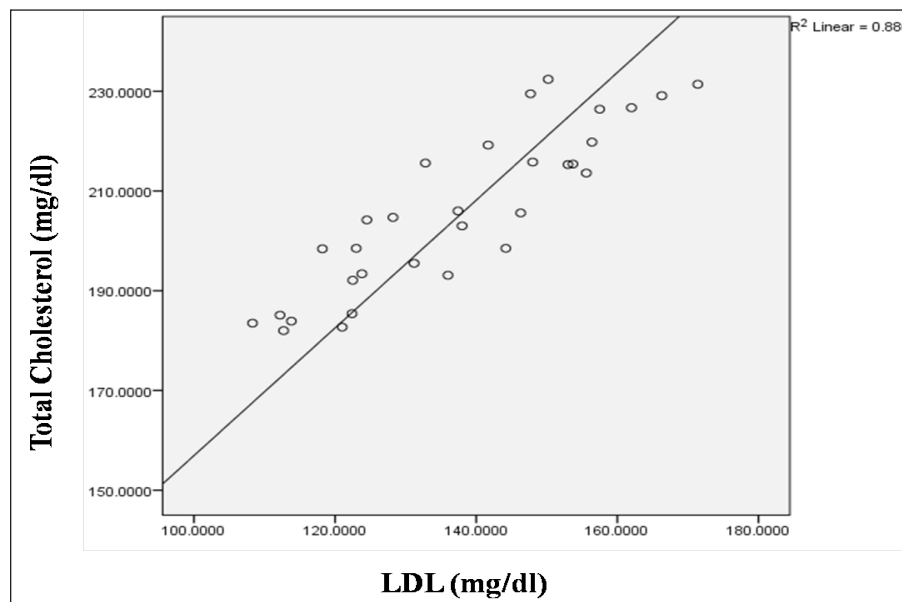


**Figure 1.** LDL-C levels and total cholesterol levels are shown in a scatter plot.

**Table 2.** Significant correlations between serum total cholesterol, triglycerides, HDL, and LDL-C have been found.

| Correlations      |                     |                |            |             |             |
|-------------------|---------------------|----------------|------------|-------------|-------------|
|                   |                     | T.CHOL (mg/dl) | TG (mg/dl) | HDL (mg/dl) | LDL (mg/dl) |
| T.CHOL<br>(mg/dl) | Pearson Correlation | 1              | 0.083      | 0.102       | .888**      |
|                   | Sig. (2-tailed)     |                | 0.661      | 0.590       | 0.000       |
|                   | N                   | 30             | 30         | 30          | 30          |
| TG<br>(mg/dl)     | Pearson Correlation | 0.083          | 1          | -0.010      | -0.337      |
|                   | Sig. (2-tailed)     | 0.661          |            | 0.960       | 0.068       |
|                   | N                   | 30             | 30         | 30          | 30          |
| HDL<br>(mg/dl)    | Pearson Correlation | 0.102          | -0.010     | 1           | -0.072      |
|                   | Sig. (2-tailed)     | 0.590          | 0.960      |             | 0.707       |
|                   | N                   | 30             | 30         | 30          | 30          |
| LDL<br>(mg/dl)    | Pearson Correlation | .888**         | -0.337     | -0.072      | 1           |
|                   | Sig. (2-tailed)     | 0.000          | 0.068      | 0.707       |             |
|                   | N                   | 30             | 30         | 30          | 30          |

## DISCUSSION

A frequent age-related illness in males known as BPH, which stands for benign prostatic hyperplasia, causes the prostate gland to expand non-malignantly, causing symptoms of incontinence and the possibility of urethral blockage. (Michael et al., 2020). We included BPH patients and controls that appeared to be in good health in our case-control study to reduce the impact of variables that caused confusion. Lipid profiles and BPH patients have been shown to be strongly correlated. Several studies have shown that age, BMI & abnormalities of various risk factors are associated with BPH. The mean age of BPH is  $(50.66 \pm 6.69)$  and apparently healthy controls are  $(50.4 \pm 3.78)$  have been found. Clinical factors that affect lipid profiles such as total cholesterol, triglycerides, LDL & HDL were found to be considerably higher in our current study's

participants compared to control people. These findings were highly consistent with earlier research that suggests that BPH may be accompanied with elevated levels of total cholesterol, triglycerides, LDL-C & HDL-C. **Dahle et al., (2002)** also noted that males with higher waist-to-hip ratios and age were more likely to undergo BPH surgery. **Nandeesh et al. (2006)** reported that BPH patients have significantly elevated levels of total cholesterol levels, TG & LDL and lower levels of HDL-C. According to **Nandeesh et al., (2006)** dyslipidemia in BPH can arise as a result of insulin resistance. It is thought that insulin, which is well known for its capacity to stimulate growth, aids in the growth of the prostate. It indicates that insulin may contribute to the enlargement of the prostate gland in BPH. Published evidence suggests an increasingly strong correlation between BPH progression and obesity. Obesity, characterized by increasing Triglyceride and reduced HDL concentration in serum, has been observed in our results. This suggests that the patients sampled for this study were at a risk of obesity, probably due to BPH. According to **Parsons, J. K., et al., (2013)** It has been suggested that obesity raises arterial pressure because to obstruction, and this has had a negative effect on the prostate. It was observed that the arterial pressure contributed to marked prostatic growth as observed in ultrasounds taken from BPH patients. If this be, then our data agrees to this, that there is an association between BPH progression and obesity. Previous research has provided evidence that an abnormal lipid profile can contribute to the development of prostatism (**Lee et.al., 1997**). Furthermore, there is a theory that suggests dyslipidemia is an indicator of risk for the development of BPH. The present study's findings align with previous research, further supporting this notion (**Hostedt et al., 1999**). An increased total cholesterol concentration as observed in our case sample pool can be a signal of hormonal dysregulation. As discussed earlier, cholesterol is directly involved in the biosynthesis of steroid hormone testosterone. This hormone has a causal relationship with BPH disease (**Holst et al., 2004**). In view of this, there could be an increase in the synthesis of testosterone hormone from the androgens, and its subsequent conversion to DHT, the active form that has been found to cause prostatic hyperplasia.

## CONCLUSION

In the current study, it was found that BPH patients had considerably higher levels of total cholesterol, triglycerides,

LDL-C, & HDL-C, compared to the apparently sound control. Numerous researches looked at the relationship between BPH patients and their age, obesity, and cardiovascular disease. Therefore, increased levels of total cholesterol, triglycerides, and lower HDL indicate the presence of BPH, making it crucial to look at the lipid profile in BPH patients, including total cholesterol, triglycerides, HDL, and LDL. The findings of this study may be useful in understanding how lipid profiles contribute to the pathophysiology of BPH (Benign Prostate Hyperplasia).

## Ethics Review

Permission from the Institutional Ethics Committee was taken (IEC/IIMS&R/2023/69), Integral Institute of Medical Sciences and research, Lucknow, U.P

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