

## Awareness and Trends of Blood Cholesterol and Susceptibility to Develop Heart Disease

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### Abstract

**Objectives:** Cholesterol is the essential steroids for life which created and used by our bodies to keep us healthy. Approximately 75% blood cholesterol produced from liver and ~25% produced from the food we eat. Hypercholesterolemia is a condition of abnormal cholesterol levels. Abnormal cholesterol levels are strongly associated with coronary heart disease. Therefore, we aimed to evaluate the awareness and frequency of trends of blood cholesterol levels (total cholesterol, LDL, HDL, triglycerides) and its associated complications.

**Methods:** This is a cross-sectional pilot study. The total no. of participant consisted of 200. We enrolled 100 unrelated healthy individuals by door to door visit to check awareness status of blood cholesterol and 100 referral individuals of lab undergone for lipid profile were enrolled in this study. Blood cholesterol awareness was calculated using Microsoft excel version 7.0. Frequency of LDL, HDL and triglycerides were calculated using chi square by SPSS version 15.0 version.

**Results:** Frequency of awareness of blood cholesterol was found to be 29% among all survey participants while as frequency of awareness of blood cholesterol were found to be 54% and 4% among educated and non-educated participants. Frequency of Desirable Cholesterol Level was found to be higher (81.0%) as compared to Borderline High (19.0%) in between lab survey participants. Frequency of Above Optimal Low density lipoprotein (LDL) level was found to be higher (64.0%) as compared to above borderline high (27.0%) and high (9.0%) among lab survey participant. Frequency of Optimal High density lipoprotein (HDL) Level was found to be to be higher (94.0%) as compare to borderline low (5.0%) and high 1.0%) among lab survey participant. Frequency of Optimal Serum Triglyceride Level was found to be higher (53.0%) in optimal as compare to borderline high (33.0%) and High (4.0%) among lab survey participant.

**Conclusion:** The survey data of door to door visit strongly suggest the lack of awareness of blood cholesterol level and its associated complications among educated and non-educated people. Individuals with borderline high Serum triglyceride level may have the risk for heart disease and they may require for therapeutic intervention in Indian setting.

**Keywords:** High blood cholesterol; Heart disease; Triglyceride; Trends of cholesterol

### Introduction

Cholesterol is steroid, essential for life. It is structural component of plasma membrane [1] and in the insulating layer of myelin wound around neurons, precursor of the synthesis of steroid hormone and vitamin D [2]. Cholesterol is synthesizes from small molecules by enzyme HMG-CoA reductase [3]. Cholesterol is the structural component of the membranes [4], functioning of nerve conduction, cell signaling and in intracellular transport [5]. Cholesterol is precursor of synthesis of bile acids, steroids and vitamin D [2]. Hypercholesterolemia is a condition of abnormal cholesterol levels. High cholesterol level in blood has greater chance of getting Coronary heart disease which is strongly associated with cardiovascular disease [6]. Cholesterol levels among US adults today are generally higher than

in all other industrial nations. During the 1990s there was some concern about cholesterol levels in American children [7]. According to Centers for Disease Control and Prevention, nearly 1 in every 10 children/adolescents in the USA has elevated total cholesterol levels [8]. India is known as tenth largest economy country in the world and spends approximately 5% of its GDP on healthcare. The private sector plays a significant role in healthcare delivery and expenditures, while public health expenditures account for an estimated 1% of GDP. With a current population of 1.2 billion, India is expected to overtake China as the world's most populous country by 2030 [9].

The transition from infectious to chronic diseases is increased as the population grows older, richer and more urbanized in India. Hyperlipidemia is complex and multifactorial disease. Environmental factor (life style, diet, tobacco use, and heavy alcohol use), medicine, overweight, lack of exercise, certain diseases (Diabetes, High blood pressure, metabolic syndrome, Kidney disease, pregnancy and levels of female hormones) and genetic factors play important role in abnormal

cholesterol levels. Diet is an important factor in India, as low dietary intake is associated with iron-deficiency or anemia, while a diet high in certain spices like curcumin may help to prevent colon cancer. In 2011, anemia [10] was the most prevalent disease in India, followed by hypercholesterolemia (high cholesterol). It is estimated that there are almost 224 million people with high cholesterol in India [11].

There have been only a few studies that have examined trends in cardiovascular risk factors in middle and low income countries [12]. A multiple cross sectional surveys were conducted among men aged 40-59 years in Yugoslavia, Italy, Greece, Holland, Finland, Japan and USA countries [13]. These studies reported that while major coronary risk factors initially stabilized and later declined in many of these countries, in middle income countries such as Yugoslavia the risk factors increased. The WHO-MONICA study reported that population risk factors increased in the Chinese while they declined in North American and Western European cohorts [14,15] Increasing trends in coronary risk factors has also been reported from many middle income Latin American countries [16]. In Asia, increasing trends in lipids and in prevalence of dyslipidemias (high LDL cholesterol and low HDL cholesterol) has been reported in urban populations of Beijing [17], rural China [18] and South Korea [19].

To our knowledge no single study that systematically evaluated trends in major cardiovascular risk factors in India exists although reviews have reported increasing prevalence of hypertension [20], diabetes [21], and hypercholesterolemia [22], and declining smoking rates among the educated Indians [23]. All these evaluations suffer from multiple biases inherent in compiling studies from different sources and different methodologies [24]. Few studies have been done on epidemiological aspect like multiple coronary heart disease risk factor in urban populations in western Indian state of Rajasthan to determine their lifestyle and other determinants [25-28]. Here we report population awareness and frequency of trends in levels of various lipoproteins (total cholesterol, LDL, HDL and triglycerides).

## Methods

### This is cross sectional pilot study

**Subjects:** A total of 200 participants consist in this study. One hundred unrelated healthy individuals were enrolled in this study for viva voice to check awareness status of blood cholesterol. One hundred referral individuals from different hospitals of Luck now for lipid profile were enrolled in this study who undergone for examination of Lipid profile from October 2013 to February 2014 from the Lal Pathology, Gomti Nagar, Lucknow, Uttar Pradesh, India and Indira diagnostic, Indira Nagar, Lucknow, Uttar Pradesh, India. We were collected the lipid profile data to evaluate the trend of blood cholesterol.

I have visited door to door in the Jankipuram sector 9 and 10 and Bithauli of Lucknow area to know the awareness status of hypercholesterolemia. Personally, we interviewed about awareness of blood cholesterol to the individuals having age range from 20-78 year in the Lucknow area.

Fasting blood sample were collected for test. All individuals were tested for Serum total cholesterol, High density lipoprotein, Low density lipoprotein, Triglyceride, Very-low-density lipoprotein using Roche Cobas Integra 400 plus kit and Olympus AU 400 chemistry Analyzer. Data were collected from Lab record.

## Statistical Analysis

Descriptive statistics of survey participants were presented as mean and SDs for continuous measures while frequencies and percentages were used for categorical measures. All statistical analysis was performed using SPSS software version 15 (SPSS, Chicago, IL, USA) and tests of statistical significance were two-sided.

## Results

The survey participant consisted of 200 individuals among them 100 participants were consisted of door to door visit and 100 participants consisted of referral lab based. The mean age of participant 47.66 and standard deviation  $\pm 13.19$ . Characteristics of lab based participant are shown in Table 1.

S.No	Variables	Participant (%)
1	Survey participant	100
2	Mean Age	47.66
3	Standard Deviation	13.19
4	Gender	
5	M	62 (62)
6	F	38 (38)

**Table 1:** Characteristics of patients.

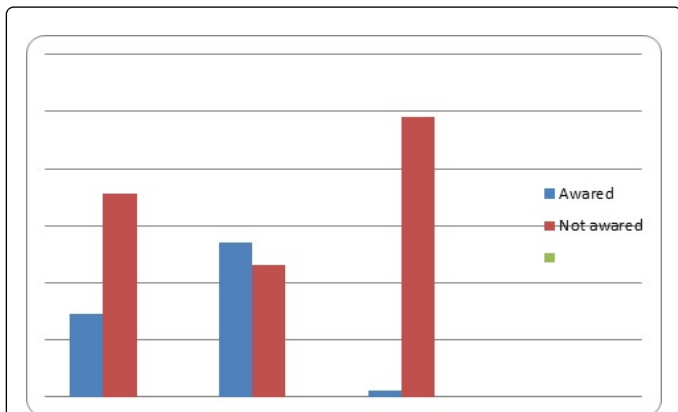
## Blood cholesterol level and awareness status in Lucknow population

We conducted the survey to know the status of blood cholesterol awareness among the educated and uneducated population of Lucknow, I have visited door to door and personally interviewed about the status of blood cholesterol found to be 29% awareness of blood cholesterol among all participants. We stratified the survey participants in educated and non-educated groups and found be 54% awareness of blood cholesterol among educated while 4% awareness among Non-educated. Again we wanted to know how many people undergone for examination of blood cholesterol level and found to be 34% people undergone for examination of blood cholesterol level among educated while as 4% people undergone for examination of blood cholesterol level among non-educated. In total, 63% individual found to positive among undergone for lipid profile while as 58.82% and 100% individual were found to be positive for High blood cholesterol level among educated and non-educated. Others remaining participant neither underwent for examination of blood cholesterol level nor have awareness about complications associated with high blood cholesterol level (Table 2 and Figures 1-3).

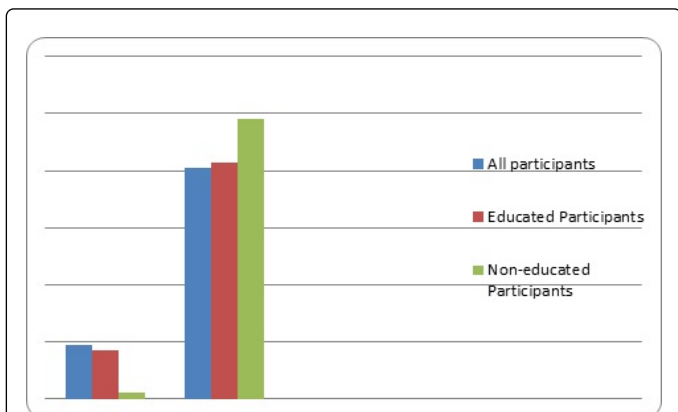
Variables	No. of Participant	Individual Aware of B.C	Individual Examined for B.C	Total positive Individual for B.C
<b>Educated</b>	N=50	N=27(54%)	N=17 (34%)	N=10 (58.82%)
<b>Non-educated</b>	N=50	N=2(4%)	N=2(4%)	N=2(100%)
<b>Total No. of participant</b>	N=100	N=29 (29%)	N=19(19%)	N=12(63%)

\*N: No. of Participant, #B.C: Blood Cholesterol

**Table 2:** Individual participants.



**Figure 1:** Frequency distribution of Awareness of Blood cholesterol among Total, educated and non-educated individuals



**Figure 2:** Frequency distribution of individual underwent for Blood cholesterol among Total, educated and non-educated individuals

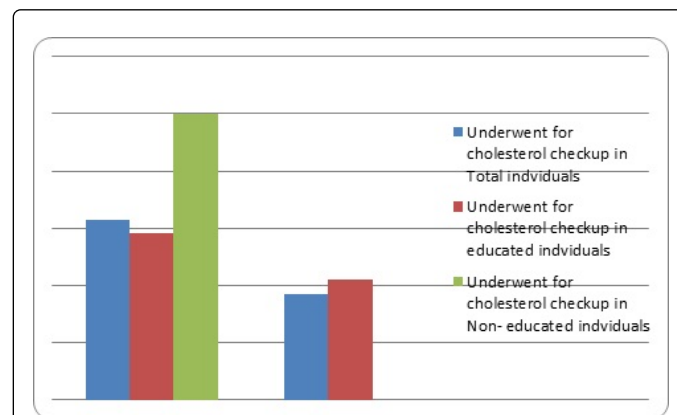
### Cholesterol Level and Lab survey participant

The frequency distributions of Serum Cholesterol level are shown in Table 3. Frequency of Desirable Cholesterol level was found to be higher (81.0%) as compared to Borderline High (19.0%) in between survey participant. However Desirable Cholesterol level showed a trend to maximum range limit (190-200 mg/dL).

The frequency distributions of Low density lipoprotein are shown in Table 4. Frequencies of Above Optimal Low density lipoprotein Level were found to be higher (64.0%) as compared to above borderline high (27.0%) and high (9.0%) among survey participant. However Optimal Low density lipoprotein level showed a trend to maximum range limit (120-130 mg/dL).

The frequency distributions of High density lipoprotein are shown in Table 5. Frequency of Optimal High density lipoprotein level was found to be higher (94.0%) as compare to borderline low (5.0%) and

high 1.0%) among survey participant. However Optimal High density lipoprotein level showed a trend to range limit (40-50 mg/dL).



**Figure 3:** Frequency distribution of positive individuals and negative individuals for Blood cholesterol among total, educated and non-educated individuals

The frequency distributions of Serum Triglyceride level are shown in Table 6. Frequency of Optimal Serum triglyceride level was found to be higher (53.0%) in optimal as compare to borderline high (33.0%) and High (4.0%) among survey participant. However, Optimal Serum triglyceride level showed a trend to range limit (130-150 mg/dL) and borderline high (160-180).

Total Level	Cholesterol Category	No. of participant N(%)
Less than 200 mg/dL	Desirable	81(81)
200-239 mg/dL	Borderline High	19(19)
240 mg/dL and above	High	0 (0)

**Table 3:** Frequency distribution of serum cholesterol level in survey participant.

LDL Cholesterol Level	LDL-Cholesterol Category	No. of participant N(%)
Less than 100 mg/dL	Optimal	64(64)
100-129 mg/dL	Near optimal/above optimal	27 (27)
130-159 mg/dL	Borderline high	9(9)
160-189 mg/dL	High	0(0)
190 mg/dL and above	Very high	0(0)

**Table 4:** Frequency distribution of low density lipoprotein in survey participant.

HDL Cholesterol Level	HDL-Cholesterol Category	No. of participant N(%)
40-60 mg/dL	Optimal	94(94)
0- 40 mg/dL	Low	5 (5)

More than 60 mg/dL	High	1(1)
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**Table 5:** Frequency distribution of high density lipoprotein in survey participant.

Serum Level	Triglycerides	Serum-Cholesterol Category	No. of participant N(%)
0-150 mg/dL		Optimal	63 (63)
150-199 mg/dL		borderline high	33(33)
200 mg/dL or more		High	4(4)

**Table 6:** Frequency distribution of serum triglyceride level in survey participant.

### Comment

High blood cholesterol is a disease that does not produce any significant symptoms unless it reaches an advanced stage like atherosclerosis. The present life style and food habits are one of the strong reasons for high blood cholesterol along with genetic reasons (obesity by family history). However the main complication of blood cholesterol is associated with either diabetes or cardiovascular problems. Lack of awareness, especially among the non -uneducated population is one of the main reasons for not being diagnosed at the right time. It is necessary that the problem of blood cholesterol is to be diagnosed at the earliest stage and the person is subjected to proper medications to have a healthier life. In the present survey only 29% individuals were aware about blood cholesterol among all participants suggesting that very less no of individual is aware about blood cholesterol in the Lucknow area population.

Everyone age 20 years and older should have their cholesterol measured at least once every 5 years. It is best to have a blood test called a lipoprotein profile to find out your cholesterol numbers. This blood test is done after a 9- to 12-hour fast and gives information about your: Total cholesterol, LDL (bad) cholesterol is the main source of cholesterol buildup and blockage in the arteries, HDL (good) cholesterol helps keep cholesterol from building up in the arteries and Triglycerides-another form of fat in your blood.

If it is not possible to get a lipoprotein profile done, knowing your total cholesterol and HDL cholesterol can give you a general idea about your cholesterol levels. If your total cholesterol is 200 mg/dL\* or more or if your HDL is less than 40 mg/dL, you will need to have a lipoprotein profile done. Cholesterol levels are measured in milligrams (mg) of cholesterol per deciliter (dL) of blood. In a previous study report presented in 2011-2012, an estimated 12.9% of U.S. adults aged 20 and over (11.1% of men and 14.4% of women) had high total cholesterol, which is unchanged since 2009-2010 Approximately 17% of adults (just over one-quarter of men and less than 10% of women) had low high-density lipoprotein (HDL) cholesterol during 2011-2012. The percentage of adults with low HDL cholesterol have decreased 20% since 2009-2010 Nearly 70% of adults (67% of men and nearly 72% of women) had been screened for cholesterol, which is unchanged since 2009-2010 [11].

HDL (good) cholesterol protects against heart disease, so for HDL, higher numbers are better. A level less than 40 mg/dL is low and is considered a major risk factor because it increases your risk for

developing heart disease. HDL levels of 60 mg/dL or more help to lower your risk for heart disease.

Earlier survey study was a prospective population survey. Cardiovascular risk factors were examined; including fasting serum lipid estimation. This was a community based study within a defined survey area in Trinidad. All men aged between 35 and 69 years within the survey area were identified and followed between 1977 and 1986. Analysis was confined to those of African, Asian Indian, and mixed descent who were free of coronary heart disease at entry (n = 960, 69% of age eligible men in the survey population. 64 men developed coronary heart disease during the study period. A strong inverse curvilinear relation was found between high density lipoprotein cholesterol and coronary heart disease incidence (p less than 0.005), independent of age or other relevant characteristics including low density lipoprotein cholesterol. A low serum concentration of high density lipoprotein cholesterol is a risk factor for coronary heart disease in non-whites as well as in whites [29].

In the present survey, the frequencies of Optimal High density lipoprotein level was found higher (94.0%) among survey participant. Therefore, it appears that risk of heart disease due to HDL is not associated among our survey participant. However, this survey has limit due to less sample size. While as survey conducted at National AIDS Research Institute, Pune during 2012 among western region population, reported that High density lipoprotein level was low (below 40 mg/dL) in 50 healthy individuals they showed low level of HDL is associated with risk of heart disease.

In the present survey, frequency of Optimal Serum triglyceride level was higher in among survey participant while as our survey showed 33.0% participant have borderline high levels of triglycerides and 4% showed high level of triglycerides. Triglycerides can raise risk of heart disease. Individuals with borderline high levels of triglycerides (150-199 mg/dL) or high (200 mg/dL or more) may require therapy in Indian setting while as in USA population, there is no need for therapeutic intervention

In summary, the survey data of door to door visit suggest that lack of awareness of blood cholesterol and its associated complication among educated and non-educated people

Lab survey participant data suggest that Individuals with borderline high Serum triglyceride level may have risk for heart disease and they may have requirement of treatment. However, this survey was conducted in a very small number of participants. Therefore, this survey warrant that further studies need to be done in larger sample size for better assessment of trends of abnormal blood cholesterol and its associated complications.

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