

# Advancing Age and Risk Factors of Cardiovascular Disease in Women: A Retrospective Study of the Population of Holalu Village, Karnataka

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## ABSTRACT

**Background & Objectives:** Cardiovascular diseases (CVDs) are the major health issues & more than one in three female adults have some form of CVDs. To determine the proportion of raised blood sugar, hypercholesterolemia, hypertriglyceridemia, raised level of low density lipoprotein cholesterol (LDL-C) & decreased level of high density lipoprotein (HDL-C) cholesterol in the study population. To assess and compare the proportion of biochemical risk factors of CVDs among participants aged < 40 years and > 40 years.

**Methods:** It is a retrospective study; the data generated from the Community Out-reach Program (COP) conducted at Holalu village was analyzed. The data includes demographic profile, history and biochemical investigations like fasting blood sugar (FBS), total cholesterol (TC), triglyceride (TG), HDL-C & LDL-C.

**Results:** Out of 448 participants (219 - males and 229 - females), 20.76% had raised blood sugar, 62.95% had hypercholesterolemia, 65.40% had hypertriglyceridemia, 57.81% had hyper LDL cholestrolemia and 1.12% had low HDL cholestrolemia. Females aged >40 years were found to have significantly high levels of ( $p<0.05$ ) TC & LDL-C as compared to males aged >40 years as well as females aged <40 years. FBS was significantly high ( $p<0.05$ ) in participants aged >40years as compared to < 40 years in both genders.

**Conclusion:** CVDs have been a significant public health problem not only in urban areas but also in rural areas. There is increased risk factor of CVDs in females aged > 40 years as compared to males and also females of age < 40 years. Health education is needed to prevent the complications of CVDs.

**Key words:** Cardiovascular disease, Raised blood sugar, Dyslipidemia, Advancing age, Women, Rural population

## INTRODUCTION

CVDs are a group of disorders of heart and blood vessels. According to the World Health Report 2002, CVDs will be the largest cause of death and disability by 2020 in India.<sup>[1]</sup> Nearly half of these deaths are likely to occur in young and middle aged individuals (30-69 years).<sup>[2]</sup>

### Global CHD (Coronary Heart Disease)

**Mortality<sup>[3]</sup>:** In 2004, CHD was the leading cause of death worldwide, leading to 7.2 million deaths (12.2% out of a total of 58.8 million deaths).

**CHD Mortality in India<sup>[4]</sup>:** The Global Status on Non- Communicable Diseases Report (2011) has reported that there were more than 2.5 million deaths from CVDs in India in 2008, two-thirds were due to CHD.

More than one in three female adults have some form of CVDs. Since 1984, the number of deaths due to CVDs in females is increasing as compared to male population of same age group.<sup>[5]</sup>

The risk factors for CVDs are increasing prevalence of hypertension, dyslipidemia, diabetes, obesity and also life style modification.<sup>[6]</sup>

CVDs are the major health issues in urban areas and in recent years the prevalence of CVDs started increasing rapidly in rural arrears as well.<sup>[7,8]</sup>

Many studies have been conducted on CVDs in urban areas but only limited studies have been done in rural areas. With this in mind, we retrospectively analyzed the data generated from the COP to assess the biochemical risk factors of CVDs at Holalu village.

The aim and objective of the study is to determine the proportion of raised blood sugar and dyslipidemia and further to assess and compare the proportion of biochemical risk factors of CVDs among participants aged < 40 years and > 40 years.

## MATERIALS AND METHODS

It is a retrospective study; data generated from the COP conducted at Holalu village by the Department of Biochemistry, Mandya Institute of Medical Sciences, Mandya was taken. According to voters list of Holalu village, 1799 individuals were more than 30 years of age. Among them, 910 were females and 889 were males, out of which 460 subjects voluntarily participated in the COP.

A pro-forma was used to get information regarding demographic history, family history, anthropometric measurements like weight, height, waist circumference and hip circumference and biochemical investigations like FBS, TC, TG, LDL-C, HDL-C. 448 subjects with completed pro-forma were included in the study and remaining subjects were excluded.

**Collection of sample:** 5ml of fasting venous blood sample was drawn under aseptic precautions into a non-vacuum plain tube with clot activator from the participants during the COP. These tubes were allowed to stand for about 25-30 minutes and were centrifuged at 3500rpm for 10- 15min. The serum was separated and these samples were processed in the Clinical Biochemistry section of Central Diagnostic Laboratory MIMS, Mandya using the fully automated random access clinical chemanalyser XL- 300 (Transasia). Each of the serum samples were tested for the biochemical parameters like FBS, TC, TG, LDL-C, HDL-C.

The reference range of fasting blood glucose & lipid profile was taken from American Diabetes Association (ADA) & Adult Treatment Panel (ATP) III Criteria respectively.<sup>[9,10]</sup>

### Biochemical investigations and methods

Following biochemical investigations were done at the time of COP

1. Blood glucose by GOD- PAP methodology
2. Total cholesterol by CHOD- POD methodology
3. Serum Triglycerides by GPO Peroxidase methodology
4. HDL-C by Direct determination (enzyme selective protection method)
5. LDL-C was calculated using Friedewald's Formula,

$$[\text{LDL-cholesterol}] = [\text{Total cholesterol}] - [\text{HDL-cholesterol}] - [\text{Triglyceride}/5]$$

Data was analyzed using descriptive statistics of Epi-data analysis version V2.2.2.178 software. The results were analyzed using the chi-square test and p value of less than 0.05 was considered as statistically significant at 95% confident interval.

### RESULTS

A total of 448 subjects included in the study, of which 219 were males and 229 were females. Further, 75 (16.74%) of the 448 subjects were in the age group of <40years, 133 (29.69%) were in the age group of 41-50 years, 106(23.6%) were in the age

group of 51-60years, 93(20.76%) were in the age group of 61-70years, while 41 (9.15%) were above 70 years (Table 1).

**Proportion of Biochemical risk factors:** The data revealed that, out of 448 participants, 318 (70.98%) had FBS < 100 mg/dl, 37 (8.26%) had FBS between 100-125 mg/dl and 93(20.76 %) had FBS  $\geq$ 126 mg/dl (Fig. 1).

The proportion of hypercholesterolemia (TC > 200mg/dl) was 62.95%, hypertriglyceridemia (TG > 150 mg/dl) was 65.40%, hyper LDL Cholesterol (LDL-C > 100 mg/dl) was 57.81% and low HDL cholesterol (HDL-C < 40 mg/dl) was 1.12% (Fig. 2).

### Comparison of biochemical risk factors between males and females aged > 40 years and < 40 years:

Out of 192 females and 181 males aged >40 years, 23.9% and 22.6% had FBS > 126mg/dl respectively. The females had higher percentage of increased blood glucose level as compared to males, but however there was no significant difference. It was also observed that 76% females aged more than 40 years had high TC and 69.3% had high LDL-C as compared to males who had 50.8% & 48.1% respectively. The data revealed that females aged >40 years have high TC, TG & LDL-C compared to males aged >40 years and it was found that there was a significant difference (p<0.05) in TC & LDL-C amongst them (Fig. 3).

The analysis of the data pertaining to males and females aged less than 40 years did not show any statistical difference in all biochemical parameters.

### Comparison of biochemical risk factors among participants aged <40 years and >40 years:

Among 219 males, 181 were aged more than 40 years and 38 aged less than 40 years. It was found that males aged >40years had significantly high FBS as compared to <40years of age (Table 2).

Out of 229 females, 192 were aged more than 40 years and 37 aged less than 40 years, the analysis of the data revealed that females aged >40 years had significant difference (p<0.05) in FBS, TC and LDL-C as compared to females aged<40years (Fig. 4).

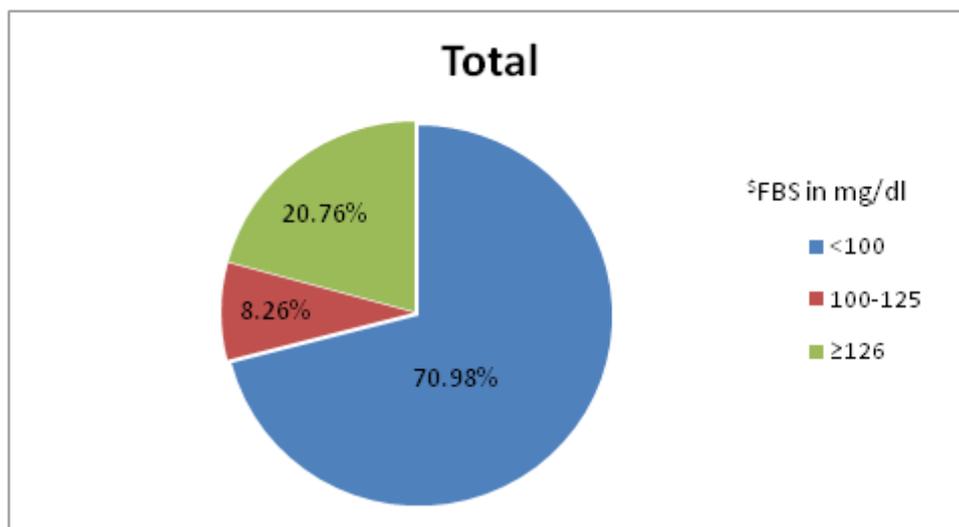
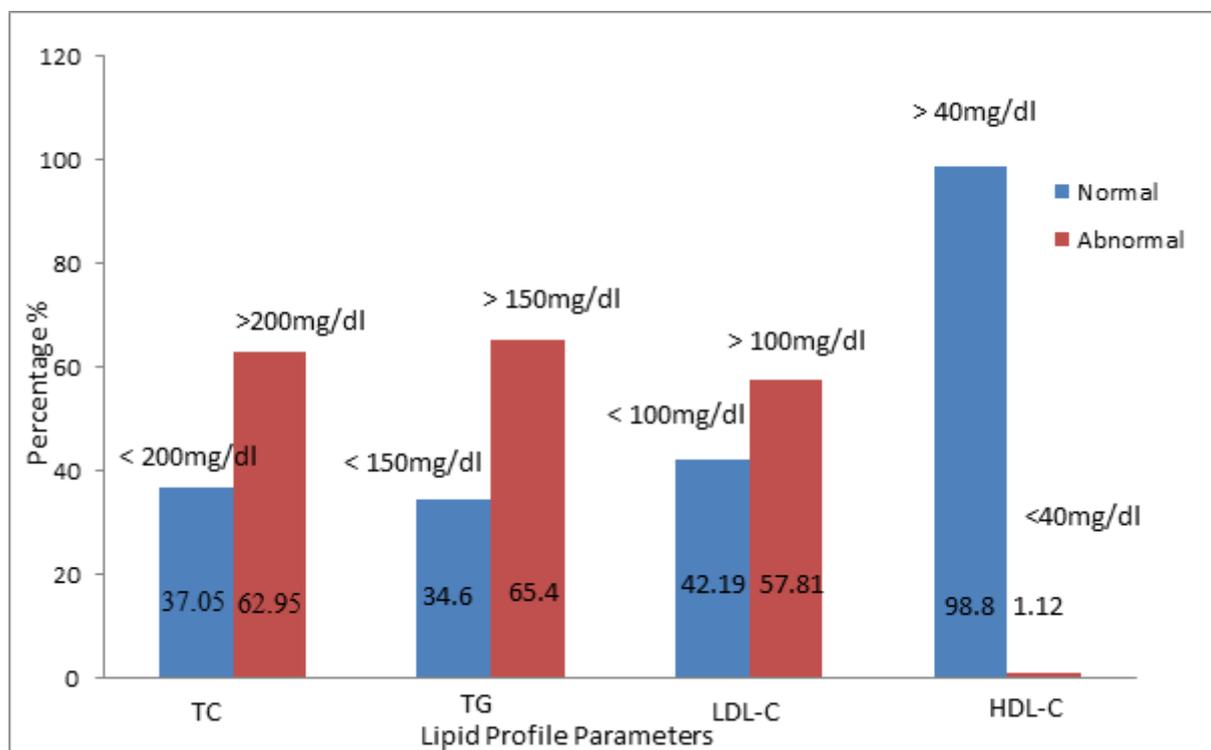
**Table 1: Demographic data of study subjects**

Age groups (Years)	Males		Females		Total	
	Number	%	Number	%	Number	%
< 40	38	17.35	37	16.16	75	16.74
41 – 50	59	26.94	74	32.31	133	29.69
51 – 60	53	24.20	53	23.14	106	23.66
61 – 70	44	20.09	49	21.40	93	20.76
>70	25	11.42	16	6.99	41	9.15
<b>Total</b>	<b>219</b>	<b>100</b>	<b>229</b>	<b>100</b>	<b>448</b>	<b>100</b>

**Table 2: Comparison of biochemical risk factors among male aged <40 years and >40 years**

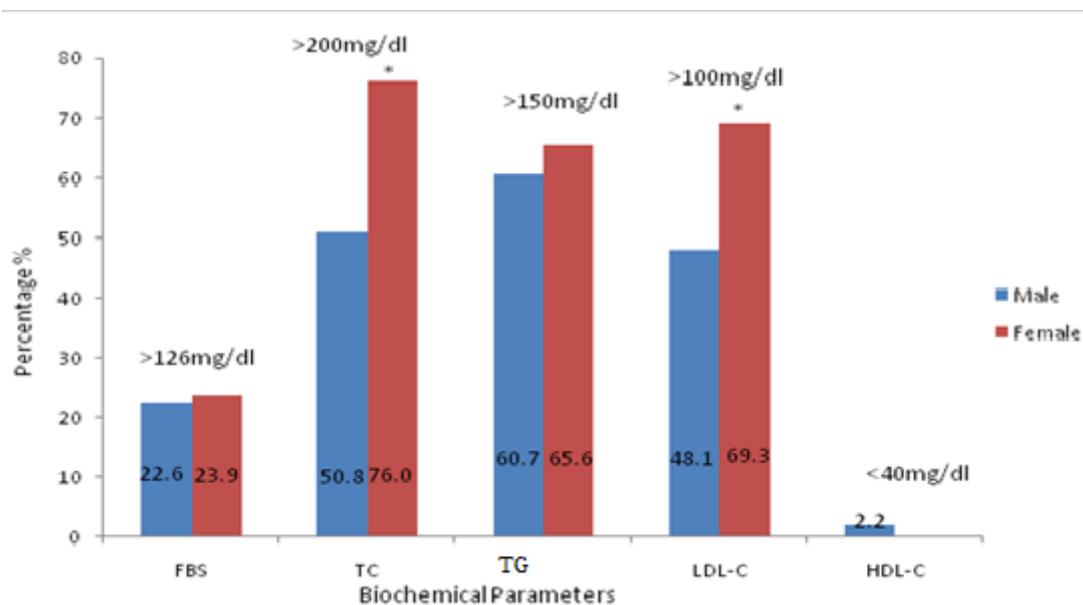
Parameters		Males < 40 years (%)	Males > 40 years (%)	p value
FBS	>126mg/dl	7.9%	22.6%	<0.05*
TC	>200mg/dl	65.78%	50.8%	>0.05
TGC	>150mg/dl	78.94%	60.7%	<0.05*
LDL-C	>100mg/dl	57.8%	48.1%	>0.05
HDL-C	<40mg/dl	2.63%	2.2%	>0.05

Males >40 years n=181, Males <40 years n= 38, \* Significant.

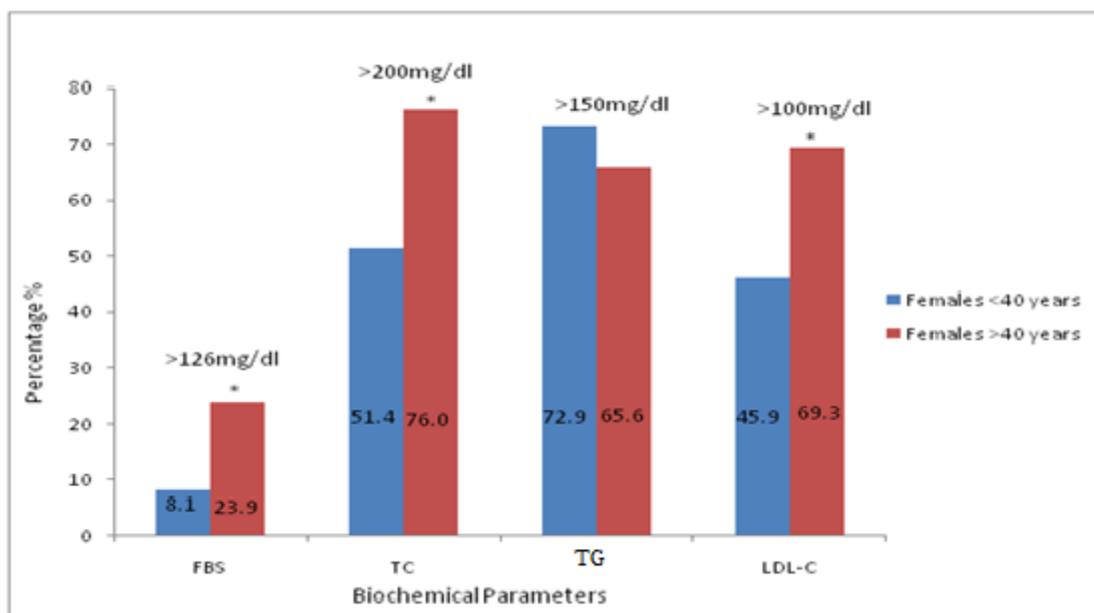
**Fig. 1: Pie chart showing distribution of study population in different categories of FBS**

# ATP III criteria

**Fig. 2: Distribution of Proportion dyslipidemia in the Study Population**



**Fig. 3: Comparison of biochemical risk factors between males & females aged >40 years**  
Males n=181, Females n=192; \*p<0.05 Significant.



**Figure 4: Comparison of biochemical risk factors among females aged <40 years and > 40 years**  
Females >40years n =192, Females <40years n=37; \*p<0.05 Significant.

## DISCUSSION

Worldwide, Non-Communicable Diseases (NCDs) are the leading cause of death. In the year 2008, about 57 million deaths had occurred globally, of which, two thirds were due to NCDs, which mainly includes CVDs, cancers, diabetes and chronic lung diseases.<sup>[11]</sup> Previously, it was thought that CVDs were less common and less severe among females in all the phases of their life. However, many recent studies have shown that women during the reproductive age, have a lower incidence of CHD; but after menopause, the incidence is the same or

higher than the males.<sup>[12]</sup> Hence assessment of risk factors using biochemical parameters plays an important role in preventing the occurrence of CVDs.

In India, CHD rates range from 1.6% to 7.4 % in rural population and 1% to 13.2 % urban population.<sup>[13]</sup> The Global Burden of Disease study estimates that 52% of CVDs deaths occur below the age of 70 years in India, out of which 41.3% of men and 44.9% of women had total cholesterol levels of 200 mg/dL, 31.9% of men and 30.0% of women had LDL cholesterol of 130 mg/dL and 31.8% of men and

12.3% of women had HDL cholesterol less than 40 mg/dL.<sup>[5]</sup>

A higher prevalence of low HDL cholesterol (<35 mg/dl) and an elevated triglyceride level (>120mg/dl) was found in the rural than in the urban population.<sup>[14]</sup>

According to the British Heart Foundation report (2012) the prevalence of hypercholesterolemia was reported as 61 % and low HDL Cholesterol was reported as 7.2 % in men and 1.7 % in women.<sup>[15]</sup>

A study conducted in Nellore district on prevalence of cardiovascular disease in rural population showed that the prevalence of raised blood sugar (FBS  $\geq$ 126 mg/dl) was found to be 5.8% and hypercholesterolemia (TC > 200 mg/dl) was 20.8%.<sup>[16]</sup>

In the present study, 20.76% had raised blood sugar, 62.95% had hypercholesterolemia, 65.40% had hypertriglyceridemia, 57.81% had hyper LDL cholesterolemia and 1.12% had low HDL cholesterolemia.

Previous studies have shown that there is high prevalence of cardiovascular risk factors among the Asian Indians. Another study showed that the proportion of cardiovascular risk factors significantly increase with age irrespective of gender and prevalence of low HDL-C was significantly more common in women as compared to men.<sup>[17]</sup>

In the present study, it was found that females aged >40 years have high TC & LDL-C as compared to males aged >40 years and it was found that there is a significant difference between them but there is no significant difference in the biochemical parameters between males & females aged <40 years.

In a study by Wang S, et al on adult Chinese population it was found that Dyslipidemia was associated with higher age, female gender and higher body mass index.<sup>[18]</sup> Present study showed that females aged more than 40 year have higher risk factors of CVDs compared to those less than 40 years. This is because women in the age group of more than 40 years are in the stage of perimenopause and menopause and there is loss of hormonal protection during these phases.<sup>[19]</sup>

In a study conducted in Hong Kong it was found that FBS increased progressively with age<sup>[20]</sup>. The data from the present study revealed that FBS >126mg/dl was significantly ( $p < 0.05$ ) high among males (22.6%) and females (23.9%) aged >40yrs compared to <40yrs (7.9% & 8.1%) respectively.

A study done in China showed that the presence of Dyslipidemia (hypercholesterolemia, Hypertriglyceridemia and low HDL cholesterol) was significantly associated with increasing age and female gender.<sup>[20]</sup> In the present study it was found that female aged more than 40 years have high proportion of TC and LDL-C compared to less than 40 years of age.

In the present study, it was found that females have higher risk factors of CVDs compared to males. This could be due to majority of the females being home makers and light workers.

The main limitation of the present study is, subjects who had impaired blood glucose level could not be followed up for confirmation of Diabetes mellitus. Study sample is very small. Further studies are needed with large population to know the prevalence of cardiovascular risk factors in rural population and to compare with the urban population.

## CONCLUSION

CVDs are a major health care problem in developing countries. With recent change in trend, the prevalence of CVDs is increasing in females as compared to males after the age of 40 years. As the age advances the biochemical risk factors are increasing in females hence the risk factors of developing CVDs and its mortality is high. Early diagnosis with the help of parameters like FBS and lipid profile by conducting community screening programs helps in reducing the burden of the disease.

The incidence of CVDs in rural areas is gradually increasing due to decreased awareness regarding the effect of westernization of diet, decreased physical activity and exercise, on lipid profile and the ill effects of Dyslipidemia. The importance of creating health awareness and the role of physical activity in reducing the complications of dyslipidemia and CVDs badly needed among the rural population. Educating the population regarding the negative effects of altered life-style patterns will bring down the occurrence of CVDs and the burden of the disease on the community.

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## CONFLICTS OF INTEREST: None

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