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Assessment of lipid profile and its correlation with ASCVD risk in the general population

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Abstract

Background: Atherosclerotic cardiovascular disease (ASCVD) is a major global health issue with high morbidity, mortality, and healthcare costs, emphasizing the need for effective risk assessment for prevention and management. This study aimed to assess the lipid profile of the general population and establish correlations with their ASCVD risk.

Methods: This cross-sectional study was conducted among the general population in India. Participants were invited through advertisements to attend the ASCVD camp for a lipid profile check-up.

Results: A total of 1068 participants were included, with a mean age of 52.7 years. The majority of participants were male (69.8%). Approximately 33% of participants had low ASCVD risk, followed by 31.6% with high risk, and 26.7% with intermediate risk. In the high ASCVD risk group, participants aged ≥60 years were significantly higher compared to those in the low risk, borderline risk and intermediate risk groups (P<0.001). The mean total cholesterol and low-density lipoprotein (LDL) were significantly increased in participants with high ASCVD risk compared to intermediate, borderline and low risk (P<0.001 and P=0.001). The mean HDL cholesterol level was significantly lower in male participants compared to female participants (P<0.001). There was a positive correlation between age (r=0.783), total cholesterol (r=0.372) and the ASCVD risk score (P<0.001 for both). There was negative correlation between HDL and ASCVD risk score (r=-124; P<0.001).

Conclusion: This study demonstrates a significant association between lipid profiles and ASCVD risk. Age, total cholesterol, and LDL levels are positively correlated with ASCVD risk, while HDL levels show a negative correlation.

Keywords: Atherosclerotic cardiovascular disease; Lipid profile; High-density lipoprotein; Low-density lipoprotein

1. Introduction

Atherosclerosis is a slowly developing condition distinguished by the hardening and narrowing of arteries, caused by the accumulation of lipids and the remodeling of the extracellular matrix [1]. Atherosclerotic cardiovascular disease (ASCVD) remains a global health issue marked by considerable morbidity, mortality, and healthcare expenditures

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[2].The increased prevalence of risk factors such as hypertension and diabetes mellitus contribute to a substantial disease burden in both developed and developing nations [2].

Males have a significantly higher risk of developing ASCVD compared to females [1]. ASCVDs have a greater impact on older adults compared to the other age groups [3]. Clinical factors linked to a higher risk of ASCVD comprise a family history of premature ASCVD, primary hypercholesterolemia, metabolic syndrome, gender-specific risk factors, chronic inflammatory conditions, chronic kidney disease, and ethnicities with an elevated risk [4].

Evaluating the risk of ASCVD is an essential for preventing cardiovascular disease (CVD) and for effective clinical management [5]. The calculation of ASCVD risk has been demonstrated to enhance shared decision-making and improve patient satisfaction [6]. Implementing intensive lifestyle modification to lower lipid levels and utilizing pharmacologic therapies are fundamental strategies for both primary and secondary prevention of ASCVD events [7]. For patients with established ASCVD, the standard medical practice involves the use of statins and other lipid-lowering therapies [8].

The chances of ASCVD events increase due to the absence of regular health checkups. Hence, early diagnosis and treatment can play a crucial role in preventing atherosclerosis from worsening the disease condition. In light of this, the present study aimed to assess the lipid profile of the general population and establish correlations with their ASCVD risk.

2. Methods

This cross-sectional study was conducted among general population in India. Participants were invited through advertisements to attend the ASCVD camp and undergo a lipid profile check-up. Data related to age, sex, treatment of hypertension and history of diabetes mellitus were obtained from each participant. Participants were also asked about their current smoking status.

2.1. Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS). Descriptive statistics was used to describe categorical variables (frequency and percentages) and continuous variables (mean and standard deviation [SD]). Comparison of qualitative data between the groups was done using the Kruskal–Wallis test and 2 Independent Sample t-Test. A comparison of quantitative data between the groups was done using the Chi-square test. A P value of <0.05 was considered statistically significant. The variables were correlated with the ASCVD risk score using Spearman's Correlation analysis.

The risk of ASCVD was categorized into low (<5%), borderline (5-<7.5%), intermediate (7.5-<20%), and high (≥20%) risk.[4]

3. Results

3.1. Demographic characteristics

A total of 1068 participants were included, with a mean (SD) age of 52.7 (14.7) years. The majority of participants (69.8%) were male. The mean total cholesterol, high-density lipoprotein (HDL) cholesterol and low-density lipoprotein (LDL) cholesterol were 185.7 mg/dL, 43.7 mg/dL, and 87.9 mg/dL, respectively. Most of the participants (51.3%) required treatment for hypertension, and the majority (74.3%) were non-smokers. About 54% of participants had a history of diabetes, and 46% of participants were on both statin and aspirin therapy. The mean ASCVD risk score was 17.0. Most of the participants (33.1%) had a low ASCVD risk, followed by high ASCVD risk (31.6%), and intermediate ASCVD risk (26.7%) (Table 1).

Table 1 Demographic characteristics

Parameter	**Number of patients (N=1068)**
Age (years), mean (SD)	52.7 (14.7)
Age (years)	
18 to <45	272 (25.5)

≥45 to <60	473 (44.3)
≥60	323 (30.2)
Gender	
Male	745 (69.8)
Female	323 (30.2)
Race	
Other (Asian)	612 (57.3)
White	456 (42.7)
Systolic blood pressure (mm Hg), mean (SD)	132.6 (20.7)
Total cholesterol (mg/dL), mean (SD)	185.7 (43.7)
HDL cholesterol (mg/dL), mean (SD), (n=1065)	43.7 (13.2)
LDL cholesterol (mg/dL), mean (SD), (n=1063)	87.9 (34.6)
Treatment for hypertension	548 (51.3)
Smoker	
Current	169 (15.8)
Former	106 (9.2)
Never	793 (74.3)
How long ago did patient quit smoking, (n=101)	
< 6 months ago	31 (30.7)
< 6 months to 1.5 years ago	20 (19.8)
1.5 years to 2.5 years ago	13 (12.9)
2.5 years to 3.5 years ago	8 (7.9)
3.5 years to 5 years ago	12 (11.9)
> 5 years ago	17 (16.8)
History of diabetes	579 (54.2)
Statin therapy	491 (46.0)
Aspirin therapy	491 (46.0)
ASCVD risk score	17.0 (18.3)
Type of ASCVD risk	
Low risk	353 (33.1)
Borderline risk	93 (8.7)
Intermediate risk	285 (26.7)
High risk	337 (31.6)
Data presented as n (%), unless otherwise specified. ASCVD, atherosclerotic cardiovascular disease; HDL, high density lipoprotein; LDL, low density lipoprotein; SD, standard deviation.	

3.2. Association of ASCVD risk with demographic parameters

Participants with low ASCVD risk were higher in the age group of 18 to <45 years (61.8%). Participants with borderline ASCVD risk were higher in the age group of ≥45 to <60 years (75.3%) and participants with intermediate ASCVD risk were higher in the age group of ≥45 to <60 years (61.1%). In the high ASCVD risk group, participants aged ≥60 years were significantly higher compared to those in the low risk, borderline risk and intermediate-risk groups (68.5% vs 29.1% vs 8.6% vs 0.3%; P<0.001). Males had a significantly higher risk of ASCVD compared to females (77.7% vs 22.3%; P <0.001). The mean level of total cholesterol and LDL cholesterol were significantly higher in participants with high ASCVD risk compared to those with intermediate risk, borderline risk and low risk (P<0.001 and P=0.001, respectively). The mean level of HDL cholesterol was significantly lower in participants with borderline ASCVD risk compared to those with low risk, intermediate risk and high risk (P=0.001). Participants with high risk required significantly more treatment for hypertension compared to those with intermediate risk, borderline risk and low risk (79.5% vs 56.1% vs 41.9% vs 22.9%; P<0.001). Participants with a high ASCVD risk observed a significantly higher proportion of participants with diabetes compared to those with intermediate risk, borderline risk and low risk (79.2% vs 57.2% vs 46.2% vs 30.0%; P<0.001) (Table 2).

Table 2 Association of ASCVD risk with demographic parameters

Parameter	**ASCVD risk**				**P value**
	Low risk (n=353)	**Borderline risk (n=93)**	**Intermediate risk (n=285)**	**High risk (n=337)**	
Age					**<0.001**
18 to <45	218 (61.8)	15 (16.1)	28 (9.8)	11 (3.3)	
≥45 to <60	134 (38.0)	70 (75.3)	174 (61.1)	92 (28.2)	
≥60	1 (0.3)	8 (8.6)	83 (29.1)	231 (68.5)	
Gender					**<0.001**
Male	221 (62.6)	61 (65.6)	201 (70.5)	262 (77.7)	
Female	132 (37.4)	32 (34.4)	84 (29.5)	75 (22.3)	
Race					**<0.001**
Other (Asian)	215 (60.9)	69 (74.2)	163 (57.2)	165 (49.0)	
White	138 (39.1)	24 (25.8)	122 (42.8)	172 (51.0)	
SBP (mmHg), mean (SD)	123.7 (17.9)	128.8 (19.2)	132.3 (19.1)	143.3 (20.5)	<0.001
Total cholesterol (mg/dL), mean (SD)	166.5 (31.2)	180.6 (37.2)	188.0 (42.2)	205.4 (48.7)	<0.001
HDL cholesterol (mg/dL), mean (SD), (n=1065)	44.9 (12.9)	44.5 (11.7)	43.8 (12.9)	[n=334] 42.0 (14.0)	0.001
LDL cholesterol (mg/dL), mean (SD), (n=1063)	[n=352] 81.9 (32.4)	90.9 (37.2)	[n=284] 87.5 (32.2)	[n=334] 93.7 (37.1)	0.001
Treatment for hypertension	81 (22.9)	39 (41.9)	160 (56.1)	268 (79.5)	<0.001
Smoker					**<0.001**
Former	3 (0.8)	0	16 (5.6)	87 (25.8)	
Current	23 (6.5)	16 (17.2)	61 (21.4)	69 (20.5)	
Never	327 (92.6)	77 (82.8)	208 (73.0)	181 (53.7)	
History of diabetes	106 (30.0)	43 (46.2)	163 (57.2)	267 (79.2)	<0.001
Statin therapy	91 (25.8)	42 (45.2)	139 (48.8)	219 (65.0)	<0.001
Aspirin therapy	91 (25.8)	42 (45.2)	139 (48.8)	219 (65.0)	<0.001

Data presented as n (%).

ASCVD, atherosclerotic cardiovascular disease; HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure; SD, standard deviation.

3.3. Association of age groups with demographic parameters

The mean total cholesterol, HDL cholesterol, and LDL cholesterol were comparable in all age groups. Participants aged ≥60 years required significantly more treatment for hypertension compared to other age group (67.5% vs 51.6% vs 31.6%; P<0.001). Participants with diabetes were significantly higher in the age group of ≥60 years compared to other age group (63.8% vs 56.9 vs 38.2%; P<0.001) (Table 3).

Table 3 Association of age groups with demographic parameters

Parameter	**Age groups**			**P value**
	18 to <45 (n=272)	**≥45 to <60 (n=473)**	**≥60 (n=323)**	
Gender				0.239
Male	187 (68.8)	342 (72.3)	216 (66.9)	
Female	85 (31.3)	131 (27.7)	107 (33.1)	
Race				0.632
Other (Asian)	159 (58.5)	275 (58.1)	178 (55.1)	
White	113 (41.5)	198 (41.9)	145 (44.9)	
SBP (mmHg), mean (SD)	132.6 (19.9)	132.5 (21.3)	132.8 (20.7)	0.951
Total cholesterol (mg/dL), mean (SD)	186.1 (42.3)	183.3 (43.4)	189.0 (45.2)	0.245
HDL cholesterol (mg/dL), mean (SD), (n=1065)	43.3 (12.1)	43.9 (13.9)	43.6 (13.1)	0.975
LDL cholesterol (mg/dL), mean (SD), (n=1063)	90.2 (34.7)	86.8 (34.8)	87.5 (34.3)	0.492
Treatment for hypertension	86 (31.6)	244 (51.6)	218 (67.5)	<0.001
Smoker				<0.001
Former	15 (5.5)	48 (10.1)	43 (13.3)	
Current	50 (18.4)	87 (18.4)	32 (9.9)	
Never	207 (76.1)	338 (71.5)	248 (76.8)	
History of diabetes	104 (38.2)	269 (56.9)	206 (63.8)	<0.001
Statin therapy	86 (31.6)	231 (48.8)	174 (53.9)	<0.001
Aspirin therapy	86 (31.6)	231 (48.8)	174 (53.9)	<0.001

Data presented as n (%).

HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure; SD, standard deviation.

3.4. Association of gender with demographic parameters

The mean HDL cholesterol level was significantly lower in male participants compared to female participants (42.7 mg/dL vs 45.8 mg/dL; P<0.001). Male participants required more treatment for hypertension compared to female (53.8% vs 45.5%; P=0.013) (Table 4).

Table 4 Association of gender with demographic parameters

Parameter	**Gender**		**P value**
	Male (n=745)	**Female (n=323)**	
Race			**0.061**
Other (Asian)	413 (55.4)	119 (61.6)	
White	332 (44.6)	124 (38.4)	
SBP (mmHg), mean (SD)	133.1 (20.5)	131.6 (21.2)	0.189
Total cholesterol (mg/dL), mean (SD)	186.8 (43.5)	183.2 (44.1)	0.183
HDL cholesterol (mg/dL), mean (SD), (n=1065)	42.7 (13.0)	45.8 (13.4)	<0.001
LDL cholesterol (mg/dL), mean (SD), (n=1063)	88.3 (35.4)	86.8 (32.9)	0.584
Treatment for hypertension	401 (53.8)	147 (45.5)	0.013
Smoker			**<0.001**
Former	101 (13.7)	5 (1.5)	
Current	163 (21.9)	6 (1.9)	
Never	481 (64.6)	312 (96.6)	
History of diabetes	390 (52.3)	189 (58.5)	0.063
Statin therapy	345 (46.3)	146 (45.2)	0.739
Aspirin therapy	345 (46.3)	146 (45.2)	0.739
Data presented as n (%). HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure; SD, standard deviation.			

3.5. Association of statin and aspirin therapy with lipid profile

The mean SBP was significantly higher in participants with statin and aspirin therapy compared to those without statin and aspirin therapy (136.3 mmHg vs. 129.5 mmHg; P<0.001). The mean total cholesterol was significantly higher in participants with statin and aspirin therapy compared to those without statin and aspirin therapy (197.0 mg/dL vs. 176.1 mg/dL; P<0.001) (Table 5).

Table 5 Association of statin and aspirin therapy with lipid profile

Parameter	**Participants with statin and aspirin therapy [n=491]**	**Participants without statin and aspirin therapy [n=577]**	**P value**
SBP (mmHg), mean (SD)	136.3 (21.8)	129.5 (19.2)	<0.001
Total cholesterol (mg/dL), mean (SD)	197.0 (47.9)	176.1 (37.3)	<0.001
HDL cholesterol (mg/dL), mean (SD)	[n=490] 44.2 (14.0)	[n=575] 43.2 (12.4)	0.522
LDL cholesterol (mg/dL), mean (SD)	[n=491] 0.4 (35.8)	[n=572] 85.7 (33.4)	0.072
Data presented as mean (SD). HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure.			

3.6. Association of diabetes with lipid profile

The participants with diabetes had significantly higher SBP compared to those without diabetes (135.1 mmHg vs. 129.6 mmHg; P<0.001). The mean total cholesterol was significantly higher in participants with diabetes compared to those without diabetes (192.4 mg/dL vs. 177.8 mg/dL; P<0.001) (Table 6).

Table 6 Association of diabetes with lipid profile

Parameter	Participants with diabetes [n=579]	Participants without diabetes [n=489]	P value
SBP (mmHg), mean (SD)	135.1 (21.1)	129.6 (19.9)	<0.001
Total cholesterol (mg/dL), mean (SD)	192.4 (47.4)	177.8 (37.5)	<0.001
HDL cholesterol (mg/dL), mean (SD)	[n=578] 44.3 (13.9)	[n=487] 42.9 (12.3)	0.244
LDL cholesterol (mg/dL), mean (SD)	[n=575] 88.3 (34.1)	[n=488] 87.4 (35.3)	0.868
Data presented as mean (SD). HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure.			

3.7. Association of treatment for hypertension with lipid profile

The mean SBP was significantly higher in participants who required treatment for hypertension compared to those who did not require treatment for hypertension (140.8 mmHg vs. 124.0 mmHg; P<0.001). Participants who required treatment for hypertension had significantly higher total cholesterol compared to those who did not require treatment for hypertension (198.6 mg/dL vs. 172.2 mg/dL; P<0.001). The mean HDL cholesterol was significantly lower in participants who did not require treatment for hypertension compared to those who required treatment for hypertension (42.4 mg/dL vs. 44.9 mg/dL; P=0.012) (Table 7).

Table 7 Association of treatment for hypertension with lipid profile

Parameter	Treatment for hypertension		P value
	Yes [n=548]	No [n=520]	
SBP (mmHg), mean (SD)	140.8 (20.8)	124.0 (16.9)	<0.001
Total cholesterol (mg/dL), mean (SD)	198.6 (46.4)	172.2 (36.1)	<0.001
HDL cholesterol (mg/dL), mean (SD)	[n=547] 44.9 (14.2)	[n=518] 42.4 (11.9)	0.012
LDL cholesterol (mg/dL), mean (SD)	[n=547] 87.4 (36.5)	[n=516] 88.4 (32.6)	0.144
Data presented as mean (SD). HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure.			

3.8. Region wise comparison of demographic parameters

In the southern region, the proportion of participants aged between ≥45 and <60 was significantly higher compared to those in the eastern, northern, and western regions (51.1% vs. 48.2% vs. 38.6% vs. 35.1%; P=0.020). Male participants were significantly higher in the east region compared to north, south and west region (77.7% vs. 71.6% vs. 68.7% vs. 51.8%; P<0.001). The mean SBP was significantly higher in participants from the northern region compared to those from the eastern, southern, and western regions (135.4 mmHg vs. 134.6 mmHg vs. 131.7 mmHg vs. 127.5 mmHg; P=0.004). The mean total cholesterol was significantly higher in participants from the northern region compared to those from the southern, eastern, and western regions (P=0.031). The mean HDL cholesterol level was significantly lower in participants from the eastern region compared to those from the northern, western, and southern regions

(P<0.001). In the eastern region, the mean LDL cholesterol level was significantly higher in the participants compared to those in other regions (P<0.001). The requirement for hypertension treatment was significantly higher in participants from the southern region compared to those in other regions (P=0.004). Participants with diabetes were significantly higher in the southern region compared to the eastern, western, and northern regions (P<0.001). Participants receiving statin and aspirin therapy were significantly higher in the south region compared to the other regions (P<0.001) (Table 8).

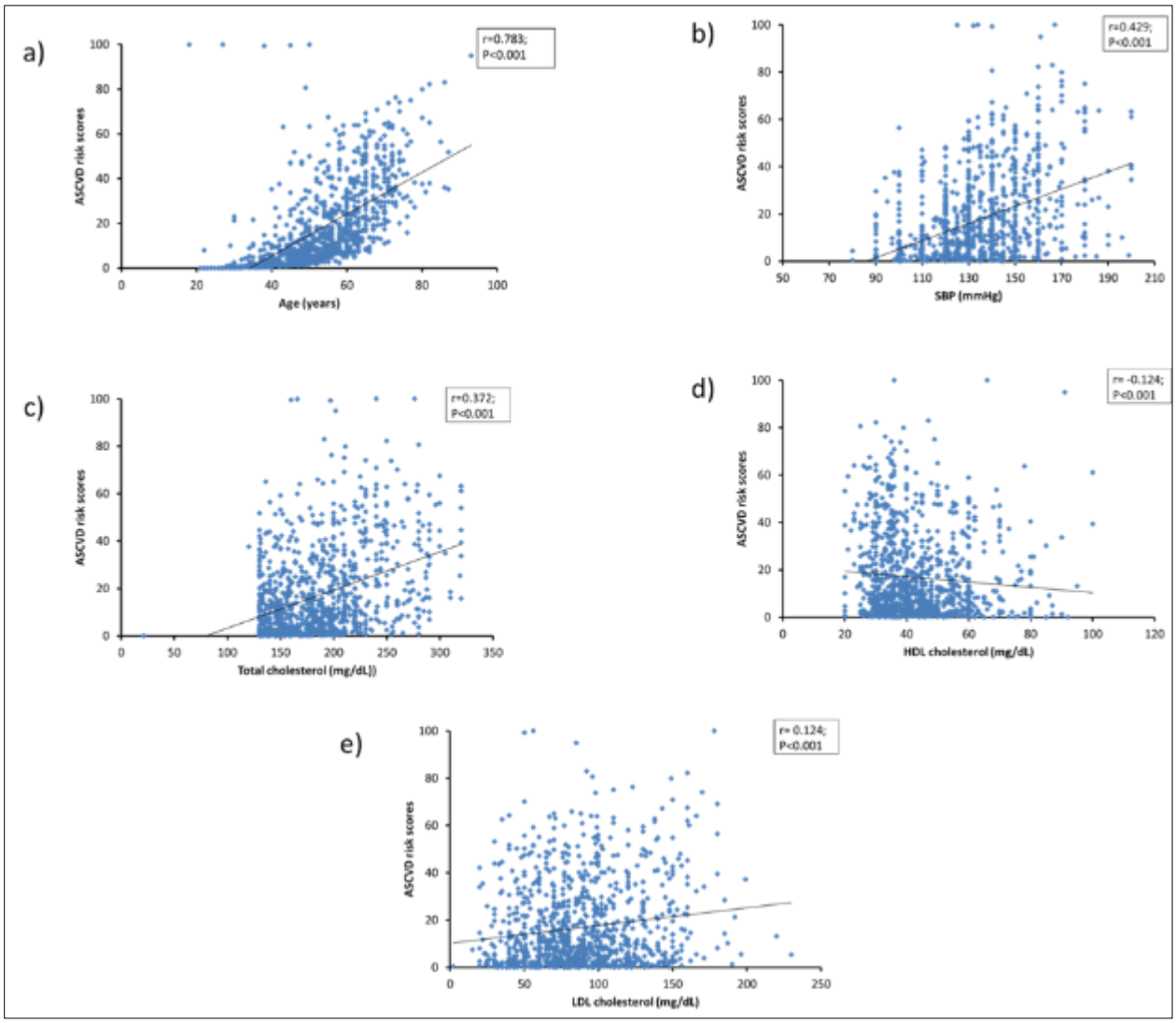
Table 8 Region wise comparison of demographic parameters

Parameter	Region				P value
	East (n=193)	North (n=88)	South (n=562)	West (n=114)	
Age					**0.020**
18 to <45	53 (27.5)	26 (29.5)	141 (25.1)	32 (28.1)	
≥45 to <60	93 (48.2)	34 (38.6)	287 (51.1)	40 (35.1)	
≥60	47 (24.4)	28 (31.8)	134 (23.8)	42 (36.8)	
Gender					**<0.001**
Male	150 (77.7)	63 (71.6)	386 (68.7)	59 (51.8)	
Female	43 (22.3)	25 (28.4)	176 (31.3)	55 (48.2)	
Race					**<0.001**
Other (Asian)	98 (50.8)	38 (43.2)	326 (58.0)	110 (96.5)	
White	95 (49.2)	50 (56.8)	236 (42.0)	4 (3.5)	
SBP (mmHg), mean (SD)	134.6 (15.2)	135.4 (17.6)	131.7 (21.8)	127.5 (20.4)	0.004
Total cholesterol (mg/dL), mean (SD)	176.9 (35.8)	192.0 (48.9)	184.5 (44.1)	173.1 (32.9)	0.031
HDL cholesterol (mg/dL), mean (SD), (n=954)	37.7 (10.6)	41.1 (11.6)	45.3 (13.1)	45.1 (13.2)	<0.001
LDL cholesterol (mg/dL), mean (SD), (n=953)	106.4 (38.1)	93.3 (34.9)	82.5 (31.3)	87.3 (36.4)	<0.001
Treatment for hypertension	78 (40.4)	46 (52.3)	299 (53.2)	46 (40.4)	0.004
Smoker					**0.006**
Former	19 (9.8)	7 (8.0)	58 (10.3)	7 (6.1)	
Current	24 (12.4)	6 (6.8)	101 (18.0)	9 (7.9)	
Never	150 (77.7)	75 (85.2)	403 (71.7)	98 (86.0)	
History of diabetes	88 (45.6)	25 (28.4)	342 (60.9)	44 (38.6)	<0.001
Statin therapy	57 (29.5)	34 (38.6)	296 (52.7)	35 (30.7)	<0.001
Aspirin therapy	57 (29.5)	34 (38.6)	296 (52.7)	35 (30.7)	<0.001

Data presented as n (%).
HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure; SD, standard deviation.

3.9. Correlation of ASCVD risk scores with clinical parameter

There was a positive correlation between age (r=0.783), systolic blood pressure (SBP, r=0.429), total cholesterol (0.372) and the ASCVD risk score (P<0.001 for all). There was a negative correlation between HDL cholesterol and ASCVD risk score (r=-0.124; P<0.001) (Figure 1).



ASCVD, atherosclerotic cardiovascular disease; HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure.

Figure 1 Correlation of ASCVD risk scores with clinical parameter a) age, b) SBP, c) total cholesterol, d) HDL cholesterol, e) LDL cholesterol

4. Discussion

Atherosclerosis not only causes or contributes to CAD but is also implicated in various other diseases. Recognizing that achieving true success in combating atherosclerosis necessitates addressing and reducing these associated diseases with equal emphasis, it becomes evident that early and intensive precision prevention can be cost-effective [9]. Patients who receive inadequate or delayed care are more likely to experience cardiovascular events and complications associated to ASCVD as well as other atherosclerotic symptoms [9]. ASCVD stands as a significant contributor to both morbidity and mortality worldwide, impacting 523.2 million people and resulting in approximately 18.6 million deaths globally in 2019 alone [10,11,12]. Therefore, a comprehensive approach is essential to tackle the multifaceted impact of atherosclerosis on health.

In the present study, majority of participants were male and the mean age was 52.7 years. These findings were similar to the previous study conducted by Suhadi R et al, where the mean age was 51.7 years and majority of participants were male [13]. In the current study, the majority of participants had never smoked, and 51.3% required hypertensive treatments. This aligns with the findings of the previous study conducted by Ahmed F et al., where the majority of participants had never smoked, and 61.4% required hypertensive treatment [13]. In a study done by Ahmed F et al., the LDL cholesterol level was 137.3 mg/dL. In the present study the LDL cholesterol level was 87.9 mg/dL [14].

The age of an individual is a significant contributor to the risk of CVD, categorizing older individuals as a high-risk population [15]. In the present study, participants aged ≥60 years had significantly higher risk of ASCVD compared to the participants aged <60 years (P<0.001). In this study, male had significantly higher risk of ASCVD compared to females (P<0.001). A study done by Kwak S et al, where the males had significantly higher incidence of ASCVD compared to female (P<0.001) [16]. The incidence of ASCVD events was fivefold higher in the highest trajectory of LDL cholesterol group compared to the optimal LDL cholesterol exposure group [17]. In the current study, participants with a high ASCVD risk had significantly higher level of LDL cholesterol. In a previous study done by Ikhsan YK et al, participants with diabetes mellitus had a significantly higher risk of ASCVD compared to patients those without diabetes [18]. Similarly in the present study, participants with a comorbid diabetes had a significantly higher risk of ASCVD.

In a previous study done by Jung HN et al, it was observed that a higher risk of ASCVD according to increasing LDL cholesterol was comparable between people aged ≥75 years and younger adults and in participants without history of CVD and not taking lipid-lowering drugs [19]. In alignment with the findings of the previous study, the levels of LDL cholesterol were comparable across all age groups in the present study. A study done by Xiong J et al, reported that the anti-hypertensive treatment prescription pattern differed between young and older patients, with younger patients being treated more aggressively [20]. In the present study, the hypertensive treatment was significantly more required in the participants aged ≥60 years compared to <60 years (P<0.001). A study conducted by Shi M et al, reported that older participants showed a higher prevalence of prediabetes and diabetes compared to young or middle-aged participants [21]. In presents study, participants with diabetes were significantly higher in the age group of ≥60 years.

In previous study, the HDL cholesterol level was significantly lower in male compared to female (46.3 mg/dL vs 56.3 mg/dL; P<0.0001) [22]. This result aligns with the findings of the present study, where the HDL cholesterol level was significantly lower in male compared to female (42.7 mg/dL vs 45.8 mg/dL; P<0.001). A study done by Russo G et al, the LDL cholesterol level was significantly higher in female compared to male (P<0.0001) [22]. In the present study, the LDL cholesterol level was comparable between males and females. A higher prevalence of diabetes was observed in males compared to females [21]. In the present study, the participants with a history of diabetes were comparable between males and females.

In the present study, the total cholesterol level was significantly higher in participants with aspirin and statin therapy compared to those without aspirin and statin therapy (P<0.001). Conversely, a study conducted by Bhatia HS found that the total cholesterol level was comparable between the non-aspirin group and the aspirin group [23]. In the current study, the HDL cholesterol and LDL cholesterol levels were comparable between both groups. Similar results were obtained in the previous study [23].

In the present study, the total cholesterol level was significantly higher in participants with diabetes compared to those without diabetes. Participants with diabetes had significantly lower HDL cholesterol compared to those without diabetes. Moreover, the LDL cholesterol level was comparable between both groups. In a previous study, an atherosclerosis patient with diabetes had high levels of total cholesterol and LDL, and a low level of HDL compared to those without diabetes and normal control individuals [24].

India Heart Watch reported a higher prevalence of total cholesterol and LDL cholesterol levels in cities across northern and western India [25]. In the present study, total cholesterol was higher in the northern region of India, followed by the southern region. Moreover, LDL cholesterol was higher in the eastern region of India, followed by the northern region.

The lower ASCVD risk was probably associated with the age of the patients, as age exhibited the strong correlation with ASCVD risk when compared to other variables [13]. In the current study, a strong positive correlation was observed between participant's age and ASCVD risk score. This indicates that ASCVD risk increased with increasing age (r=0.783; P<0.001). The correlation between cholesterol levels and ASCVD risk is bidirectional; increasing cholesterol levels raises the risk, while reducing levels decreases risk [26]. In the current study, a positive correlation was observed between total cholesterol level and ASCVD risk, indicating that the risk of ASCVD increased with increasing level of total cholesterol. A study conducted by Saeed AB et al, reported that HDL was negatively associated with ASCVD; thus, as HDL increases, the ASCVD risk score decreases [27]. In the present study, a negative correlation was observed between HDL cholesterol and ASCVD risk score. This indicates that the ASCVD risk score increased with decreasing HDL cholesterol level.

Limitations

This study has several limitations. Firstly, the small sample size may limit the generalizability of the findings to a broader population. Additionally, being a real-world study, there may be inherent variability and confounding factors that could impact the accuracy of the results. Furthermore, the need for future studies is underscored to validate and extend the current findings.

5. Conclusion

The findings of this study highlight a significant association between age group, total cholesterol, LDL cholesterol, HDL cholesterol, and the risk of ASCVD. The positive correlation between age, total cholesterol and the ASCVD risk indicates that the ASCVD risk score increases with increasing the participant's age and total cholesterol levels. Furthermore, a negative correlation between HDL cholesterol and the ASCVD risk score indicates that a decrease in HDL cholesterol corresponds to an increase in ASCVD risk scores.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This manuscript is based on data collected during healthcare camps and hence ethical approval was not deemed necessary.

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