Original Research Article

A Systematic Study in Alliance with Blood Groups Associated with Cardiovascular Risk Status

Sarayu Nagula[1], Harshini Tanniru[2], Sai Mounica[3]

[1,2,3]Department of Pharm. D (Doctor of pharmacy), Browns College of Pharmacy, Kakatiya University, Khammam, Telangana, India.

Corresponding Author: Sarayu Nagula

ABSTRACT

Background and Objective: CVD is the leading cause of death in males and females. In real females with wider range of symptoms are more likely to delay seek medical care and less likely to be investigated and treated with EBM, angioplasty/ CA bypass graceful than men.
A systematic study in alliance with blood groups with cardiovascular risk status to study the improvement of cardiovascular health and quality of life through prevention, detection and treatment of risk factors for heart attack and stroke, also to understand the prevention of repeated cardiovascular events and reduction in deaths from cardiovascular disease.
Methodology: An observational Prospective study was conducted between June2022-May2023 in the Govt. District headquarters hospital in Khammam locality.
Results: A total of 200 patients of different age groups and gender were included and their information was sampled. The mean systolic blood pressure was significantly high in B blood group when compared to other blood groups (p value 0.02). The diastolic blood pressure did not differ among individuals with blood types A, B, AB, and O. Similarly, there was no association of blood pressure with Rhesus (Rh) blood group.
Conclusion: Findings of this study suggest that B blood group individuals have more susceptibility for cardiovascular diseases indicating a potential genetic association between ABO blood group and hypertension. Further studies are essential in larger population to more clearly elucidate these results.

Keywords: Blood group, Blood pressure, Hypertension, Stroke, Cardiovascular, Risk factors, Rhesus (Rh), ABO blood type.

INTRODUCTION

Cardiovascular disease (CVD) encompasses a broad spectrum of medical conditions that specifically target the circulatory system, comprising both the heart and blood vessels. These conditions may involve issues such as narrowing or blockage of blood vessels, heart muscle dysfunction, and abnormalities in blood flow, all of which contribute to impaired circulatory function and increased risk of related complications such as heart attacks and strokes. [1] This encompasses various congenital and acquired disorders. In Europe, CVD is the primary non-communicable cause of death, accounting for 50% of all fatalities, and it contributes to 30% of all deaths globally.[2] In 2008, nine million people died prematurely from non-communicable diseases before reaching the age of 60; around eight million of these early deaths happened in low- and middle-income countries. [3]
Cardiovascular disease includes atherosclerosis, which manifests in various

forms such as coronary artery disease (CoAD), cerebral artery disease (CeAD), and peripheral artery disease (PAD). It is associated with significant complications such as myocardial infarction, ischemic stroke (more prevalent than hemorrhagic stroke), heart failure (HF), cardiac valvulopathies, arrhythmias, rheumatic heart disease (caused by streptococcal bacteria, leading to damage of the myocardium and cardiac valves), congenital heart disease, and deep vein thrombosis, which can result in pulmonary embolism.

Cardiovascular diseases (CVDs) consist of a variety of disorders involving the heart and circulatory system. They include [4]:

- Coronary heart failure –It is a condition affecting the blood vessels that supply the heart muscle.
- Peripheral arterial disease – A condition affecting the blood vessels that supply blood to the arms and legs.
- Cerebrovascular disease –It refers to conditions affecting the blood vessels that supply to the brain.
- Congenital heart disease – Birth defects affecting the normal development and function of the heart are caused by malformations of the heart's structure present from birth.
- Rheumatic heart disease – The damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria.
- Deep vein thrombosis and pulmonary embolism – The blood clots in the leg veins, which can dislodge and move to the heart and lungs.

RISK FACTORS AND CAUSES OF CARDIOVASCULAR DISEASE

1. **High blood pressure:** High blood pressure (hypertension) is one of the most important risk factors for CVD. The increase in the blood pressure, leads to the damage of blood vessels. [5]
2. **Smoking:** Smoking and other tobacco use is also a significant risk factor for CVD. The harmful substances present in tobacco can damage and narrow the blood vessels. [6]
3. **High cholesterol:** Cholesterol, a lipid substance present in the bloodstream, can lead to the narrowing of blood vessels and elevate the risk of blood clot formation when its levels are high.
4. **Diabetes:** Diabetes is a lifelong condition that causes your blood sugar level to become too high. Elevated blood sugar levels can lead to blood vessels damage, increasing the chances of narrowing. A significant number of individuals with type 2 diabetes are overweight or obese, which further increases their risk of CVD.
5. **Inactivity:** Irregular exercise increases the likelihood of developing high blood pressure, elevated cholesterol levels, and obesity, all of which are risk factors for cardiovascular disease (CVD). Regular physical activity promotes heart health and, combined with a balanced diet, helps in managing weight effectively. [7]
6. **Being overweight or obese:** Being overweight or obese increases your risk of developing diabetes and high blood pressure, both of which are risk factors for CVD. [8]

   The increased risk of CVD if:
   - The body mass index (BMI) is 25 or above – use the BMI healthy weight calculator to work out your BMI. [6,9]
   - A man with a waist measurement of 94cm (about 37 inches) or more, or a woman with a waist measurement of 80cm (about 31.5 inches) or more.
7. **Family history of CVD:** Having a family history of CVD, will increase the risk of developing it.

Considering having a family history of CVD if either:

- If your father or brother were diagnosed with cardiovascular disease before the age of 55, it increases your risk of developing the condition as well.
- If your mother or sister were diagnosed with cardiovascular disease before the

age of 65, it also raises your risk of developing the condition.

8. Ethnic background: In the UK, individuals of South Asian and Black African or African Caribbean backgrounds have an elevated risk of developing cardiovascular disease (CVD). This is often due to a higher prevalence of additional risk factors for CVD, such as hypertension or type-2 diabetes, within these communities.

9. Other risk factors

Additional factors influencing your risk of developing cardiovascular disease include:

Top of Form

- Age: The risk of cardiovascular disease increases with advancing age, particularly in individuals over 50.
- Gender: Men are more prone to developing cardiovascular disease at a younger age compared to women.
- Alcohol: Consuming excessive amounts of alcohol can elevate cholesterol and blood pressure levels, and contribute to weight gain.
- Diet: Unhealthy eating habits can lead to elevated cholesterol levels and high blood pressure, further increasing the risk of cardiovascular disease.

Symptoms of heart attacks and strokes

Often, diseases of the blood vessels can develop without noticeable symptoms. In certain instances, the first indication of these underlying conditions may be a heart attack or stroke. [10] Symptoms of a heart attack could encompass:

- Chest pain or discomfort at the centre.
- Pain or discomfort in the arms, left shoulder, elbows, jaw, or back.[11]

Moreover, individuals may face challenges with breathing or feel breathless, experience nausea or vomiting, dizziness or faintness, cold perspiration, and a pallid complexion.

Shortness of breath, nausea, vomiting, and back or jaw pain are more frequently observed in women compared to men.

A prevalent symptom of a stroke is frequently a sudden weakness affecting one side of the body, commonly in the face, arm, or leg.

Other symptoms may include:

- Sensation loss in the face, arm, or leg, notably on one side of the body.
- Confusion, trouble speaking, or difficulty understanding speech
- Vision problems in one or both eyes
- Trouble walking, dizziness, or loss of balance and coordination
- Severe headache without a known cause
- Fainting or loss of consciousness

MATERIALS & METHODS

A prospective observational study was carried out on reducing the risk in developing cardiovascular diseases for a period of six months (June2022-May2023) in the Department of Cardiology, Khammam Government Hospitals, a 500 bedded multispecialty hospital situated in Khammam. The study was conducted after approval by Institutional Human Ethical Committee, Browns College of Pharmacy with the approval IRB. A total of 200 patients from the in-patient department of Cardiology in Khammam Government Hospitals, who were diagnosed with various cardiovascular diseases, were included after obtaining the Permission for collection of data and to accompany physician in Cardiology ward from Head of the Cardiology department. All patients and caregivers were informed about the study objectives and data confidentiality, and were asked to indicate their understanding about study conditions and agreement by signing an informed consent form. A patient pro forma was designed, this provides information about patient demographic details such as age, gender, date of admission and discharge, type of disease, history of current illness, past medical history, social and family history, name of the drugs, dosage regimen(dosage form, route, frequency and duration) and risk factors. Patients were enrolled based on inclusion and exclusion criteria.

Inclusion criteria:

- Both Male and female patients of age 35-75 years were included in the study.

- Patients diagnosed with various cardiovascular diseases were included in the study.
- Patients with identified and unidentified risk factors were included.

Exclusion criteria:
- Patients below the age of 35 and above 75 years are excluded in the study.
- Patients who do not cooperate to provide necessary information are excluded in the study.
- Patients such as child, pregnant women, and feeding mothers are excluded from the study.
- Patients with other diseases/disorders were excluded.

RESULT

A Prospective observational study was conducted in Khammam locality for a period of 6 months. A total of 200 patients were enlisted under the inclusion and exclusion criteria.

PATIENT CATEGORISATION BASED ON AGE

In our study, we collected 200 cases of cardiovascular diseases. Among the data collected out of 200 patients below 30yrs are found to be 23 patients with 11.5% and then 31 to 40yrs are found to be 37 patients with 18.5% and then 41 to 50yrs are found to be 67 patients with 33.5% and then 51 to 60yrs are found to be 53 patients with 26.5% and finally 61 to 70yrs are found to be 20 patients with 10%. Results were shown in the table below.

AGE	NO.OF. PATIENTS	PERCENTAGE
<30 years	23	11.5%
31-40 years	37	18.5%
41-50 years	67	33.5%
51-60 years	53	26.5%
61-70 years	20	10%

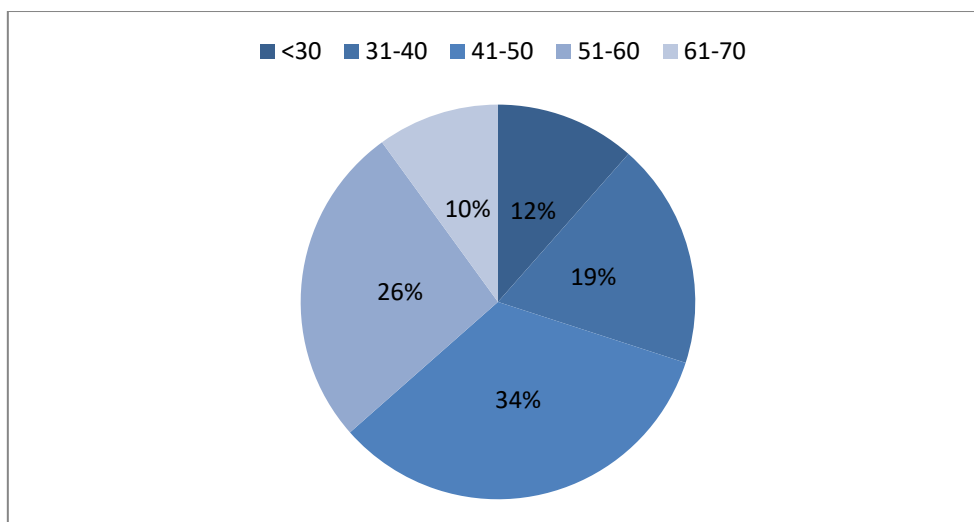**Table No: 1 PATIENT CATEGORISATION BASED ON AGE**

Fig. no: 1. PATIENT CATEGORISATION BASED ON AGE.

PATIENT DISTRIBUTION BASED ON GENDER

Among the data collected out of 200 patients 136 patients with 68.5% were found to be male and 64 patients with 32% were found to be females.

Results were shown in the table below.

GENDER	NO. OF PATIENTS	PERCENTAGE
Male	136	68.5%
Female	64	32%
Total	200	100%

TABLE NO 2: PATIENT DISTRIBUTION BASED ON GENDER
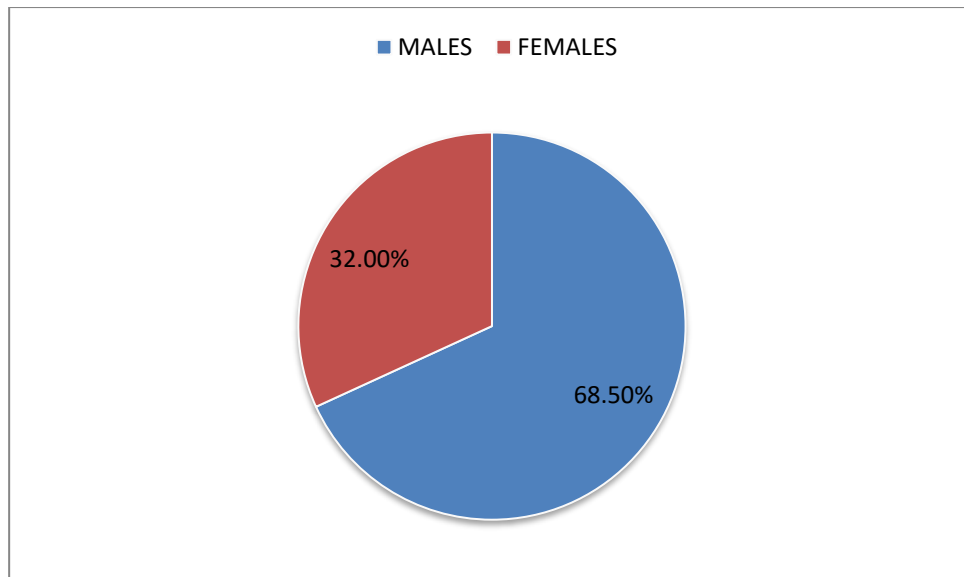
Fig no 2: PATIENT DISTRIBUTION BASED ON GENDER

PATIENT DISTRIBUTION BASED ON BLOOD GROUP

Among the data collected out of 200 patients 61 patients with 30.5% were found to be B+,46 patients with 23% were A+,19 patients with 9.5% were AB+,28 patients with 14% were O+,14 patients with 7% were A-,9 patients with 4.5% were B-,11 patients with 5.5% were AB-,12 patients with 6% were O-.

Results were shown in the table below.

BLOODGROUP	NO. OF PATIENTS	PERCENTAGE
A+	46	23%
B+	61	30.5%
AB+	19	9.5%
O+	28	14%
A-	14	7%
B-	9	4.5%
AB-	11	5.5%
O-	12	6%

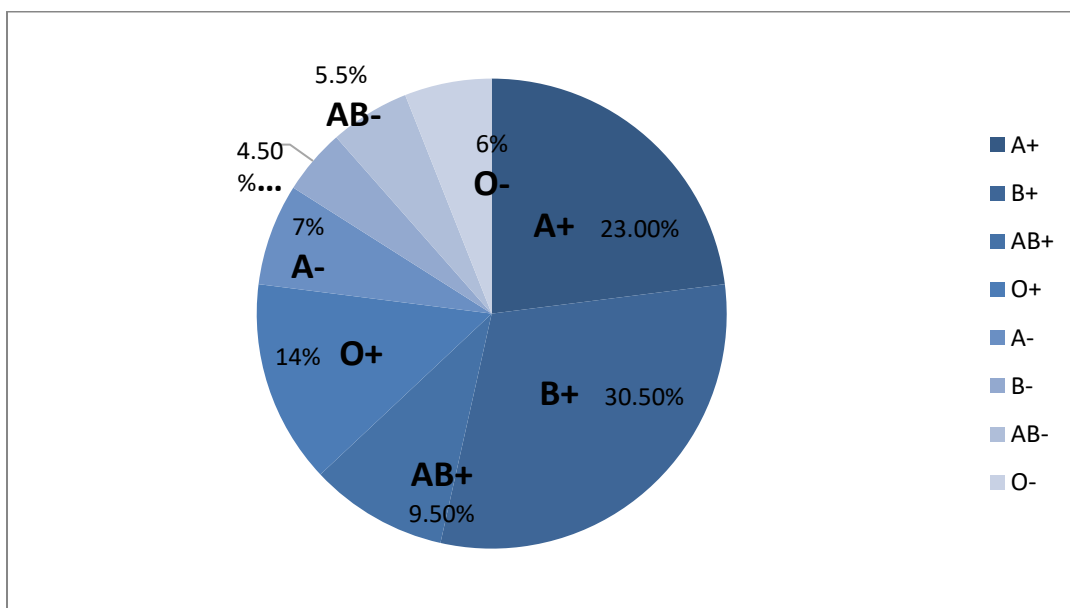**TABLE NO 3: PATIENT DISTRIBUTION BASED ON BLOOD GROUP**

Fig no 3: PATIENT DISTRIBUTION BASED ON BLOOD GROUP

PATIENT CATEGORISED BASED ON RISKFACTOR

Among the data collected out of total individuals' patients with environmental triggers in males are found to be 9(4.5%) and patients of females are found to be 5(2.5%). Patients with genetic cause in males are found to be 18(9%) and patients of females are found to be 15(7.5%). Patients with social habits in males are found to be 15(6%) and patients of females are found to be 6 with 3%.

Patients with HTN in males are found to be 27 with 13.5% and patients of females are found to be 20 with 10%. Patients with DM in males are found to be 13 with 6.5% and patients of females are found to be 11 with 5.5%. Patients with physical inactivity in males are found to be 16 with 8% and in females are found to be 8 with 4%. Patients with cholesterol in males are found to be 20(10%) and patients of females are found to be 12 with 6%. Patients with diet in males are found to be 14(7%) and patients of females are found to be 10 with 5%.

Results were shown in the table below.

RISKFACTOR	MALE	PERCENTAGE	FEMALE	PERCENTAGE
ENVIRONMENTAL TRIGGERS	9	4.5%	5	2.5%
GENETIC CAUSE	18	9%	15	7.5%
SOCIAL HABIT	15	6%	6	3%
HTN	27	13.5%	20	10%
DM	13	6.5%	11	5.5%
PHYSICAL INACTIVITY	16	8%	8	4%
CHOLESTEROL	20	10%	12	6%
DIET	14	7%	10	5%

TABLE NO.4: PATIENT CATEGORISED BASED ON RISKFACTOR.
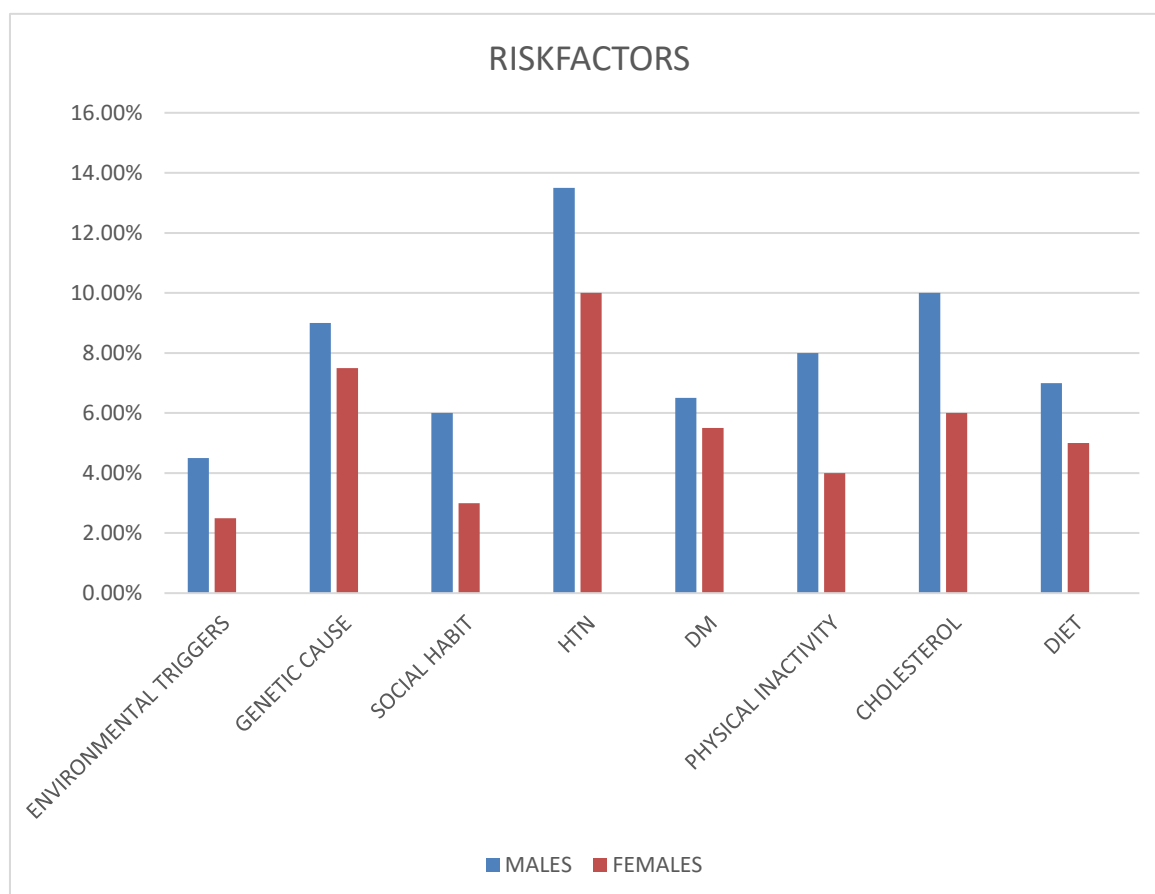

Fig no 4: PATIENT CATEGORISED BASED ON RISKFACTORS.

TYPE WISE CATEGORIZATION OF CARDIOVASCULAR DISEASES

Among the data collected out of total individual's patients with CAD are found to be 43 with 21.5%, with MI are found to be 37 with 18.5%, LV DYSFUNCTION found to be 45 with 22.5%, DCMP found to be 31 with 15.5%, UNSTABLE ANGINA found to be 20 with 10 %, MS found to be 6 with 3% and STROKE found to be 18 with 9%. Results were shown in the table below.

CATEGORY	NO. OF PATIENTS	PERCENTAGE
CAD	43	21.5%
MI	37	18.5%
LV DYSFUNCTION	45	22.5%
DCMP	31	15.5%
UNSTABLE ANGINA	20	10%
MITRAL STENOSIS	6	3%
STROKE	18	9%

TABLE NO.5: TYPE WISE CATEGORIZATION OF CARDIOVASCULAR DISEASES
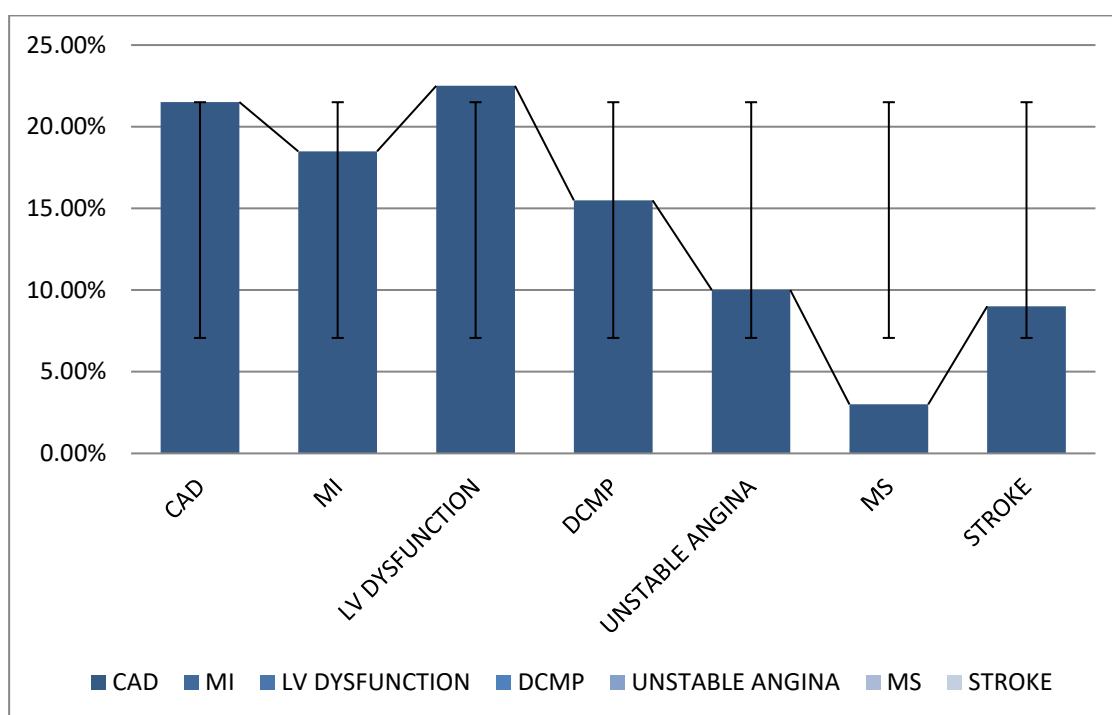

Fig no 5: TYPE WISE CATEGORIZATION OF CARDIO VASCULAR DISEASE ACCORDING TO THEIR FREQUENCY.

PATTERN OF SYMPTOMS ON CARDIOVASCULAR DISEASE PATIENTS BASED ON GENDER

Out of total number of patients i.e. 200, the male patients of 46(23%) and female patients of 38(19%) were most commonly experienced of chest pain/pressure,24(12%) of male patients, female patients of 17(8.5) were experienced with the symptom like palpitationst,SOB15(7.5%) of males, 8(4%) of females, discomfort in hand9(4.5%) of males, females of 11(5.5%), sweating experienced by males is 12(6%), females is 16(8%), and nausea in males is 7(3.5%),in females of 8(4%).

Results are shown below

SYMPTOMS	MALE	PERCENTAGE	FEMALE	PERCENTAGE
CHEST PAIN/PRESSURE	46	23%	38	19%
PALPITATIONS	24	12%	17	8.5%
SOB	15	7.5%	8	4%
DISCOMFORT IN HAND	9	4.5%	11	5.5%
SWEATING	12	6%	16	8%
NAUSEA	7	3.5%	8	4%

TABLE NO.6: SYMPTOMS ON CARDIOVASCULAR DISEASE PATIENTS BASED ON GENDER

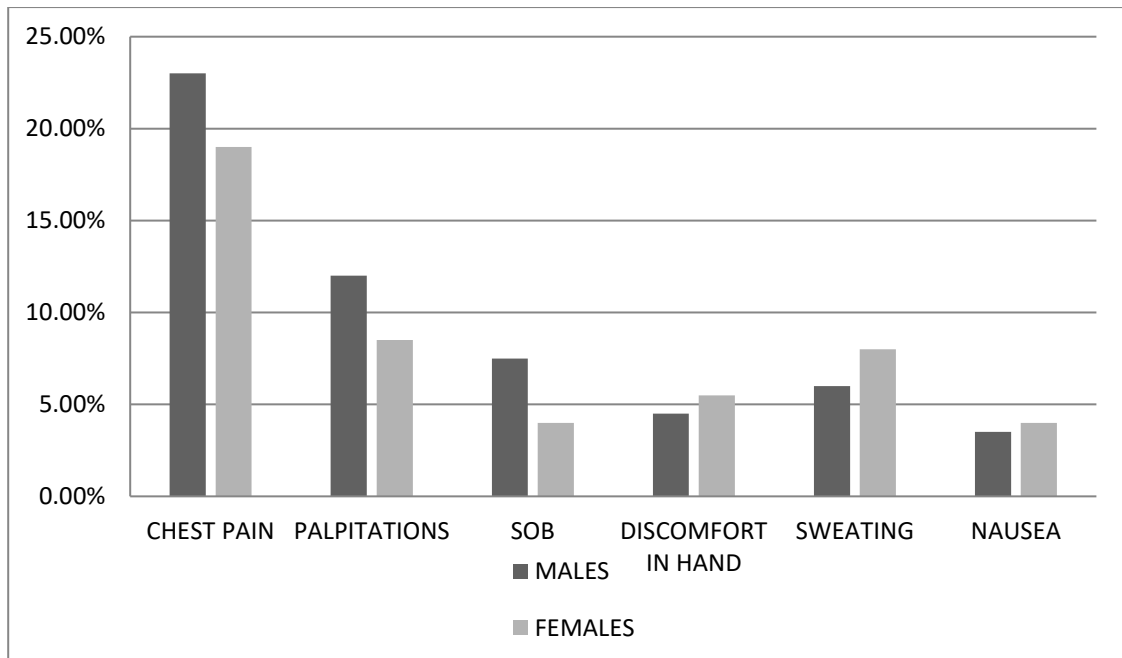**Fig no 6: SYMPTOMS ON CARDIOVASCULAR DISEASE PATIENTS BASED ON GENDER**

BASED ON FOLLOW UP PERIODS:
Out of 200 patients we have followed up 180 patients for up to 5 days and 100 patients followed up for above 5 days.

Results are shown below

DAYS	NO. OF PATIENTS	PERCENTAGE
1-5 Days	130	65%
>5Days	70	35%
Total	200	100%

Table No: 7 FOLLOW UP PERIODS
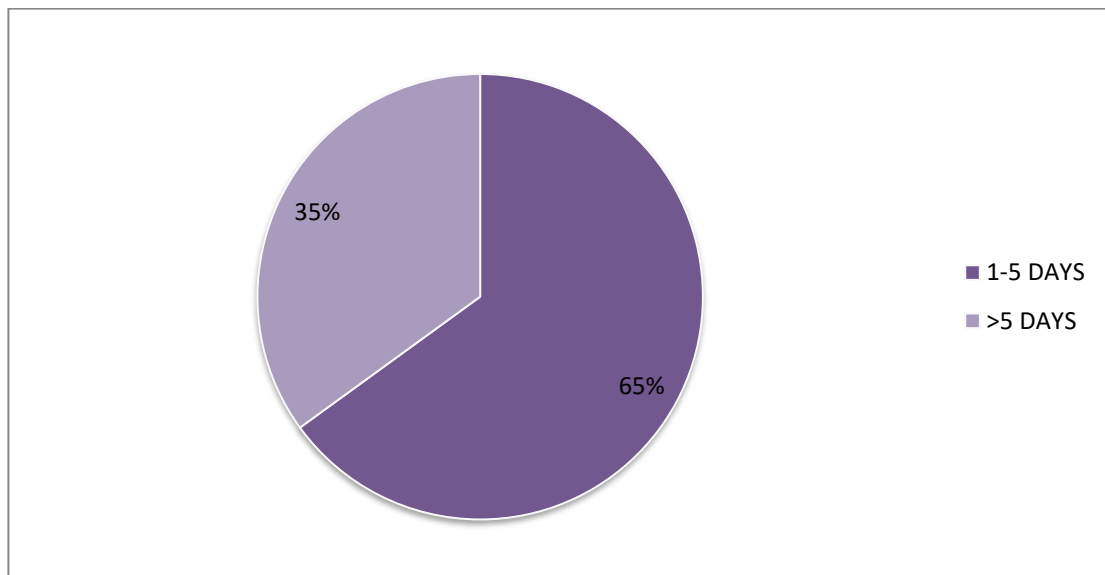
Fig no 7: PIE CHART OF FOLLOE UP PERIOD

PATIENT CATEGORIZATION BASED ON SOCIAL HISTORY:
Among the data collected out of total individual's patients. 82(41%) Patients have history of alcohol,50(25%) patients have history of smoking and 68(34%) patients have history of both alcohol and smoking. Results were shown in the table below.

SOCIAL HABIT	NO OF PATIENTS	PERCENTAGE
ALCOHOL	82	41%
SMOKING	50	25%
BOTH ALCOHOL AND SMOKING	68	34%

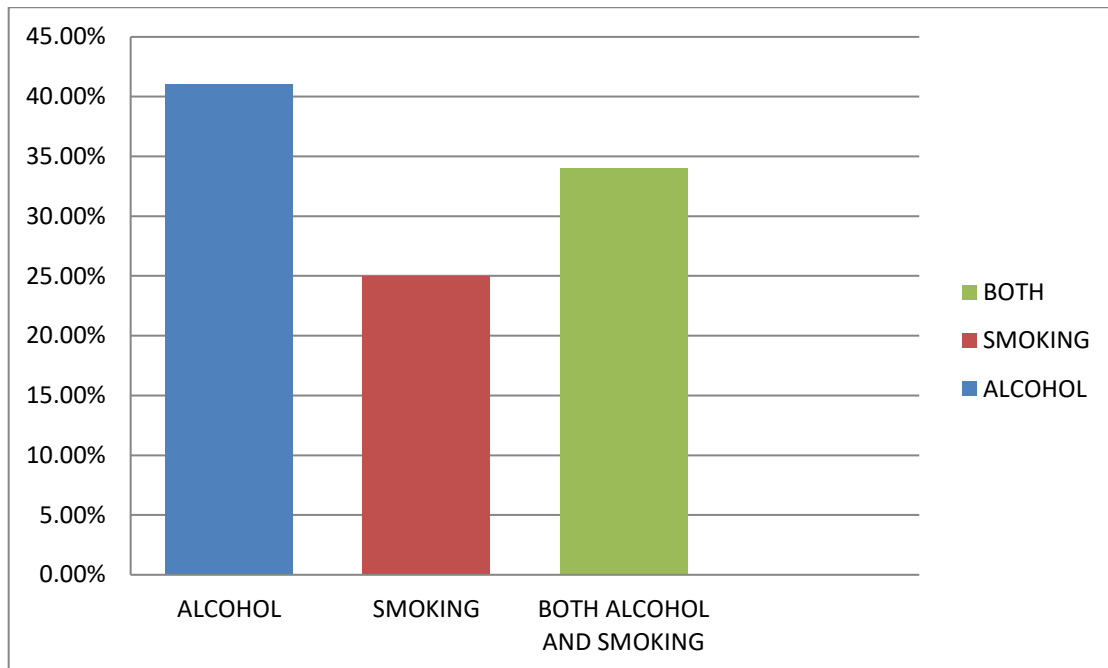**Table No: 8. TABLE OF SOCIAL HABITS OF THE PATIENTS**

Fig no 8: PATIENT CATEGORIZATION BASED ON SOCIAL HISTORY

PATTERN OF DRUGS IN SPECIES ACCORDING TO THEIR FREQUENCY

Among the data collected out of 200 patients using drugs like CLOPITAB are found to be 118 with 59%, ROSUVASTATIN are found to be 88 with 44%, MET XL are found to be 90 with 45%, HEPARIN is found to be 80 with 40%, ECOSPRIN are found to be 134 with 67%.

Whereas LASIX are found to be 16 with 8%, NTG are found to be 78 with 39%, ENAM are found to be 34 with 17%, DOBUTAMINE are found to be 20 with 10%, AXCER are found to be 12 with 6%, LMWH are found to be 44 with 22%, SORBITRATE are found to be 36 with 18%, and finally ATORVASTATIN are found to be 72 with 36%.

Results were shown in the table below.

DRUGS	NO. OF. PATIENTS	PERCENTAGE
CLOPITAB	118	59%
ROSUVASTATIN	88	44%
MET XL	90	45%
HEPARIN	80	40%
ECOSPRIN	134	67%
LASIX	16	8%
NTG	78	39%
ENAM	34	17%
DOBUTAMINE	20	10%
AXCER	12	6%
LMWH	44	22%
SORBITRATE	36	18%
ATORVASTATIN	72	36%

TABLE NO.9: PATTERN OF DRUGS IN SPECIES ACCORDING TO THEIR FREQUENCY
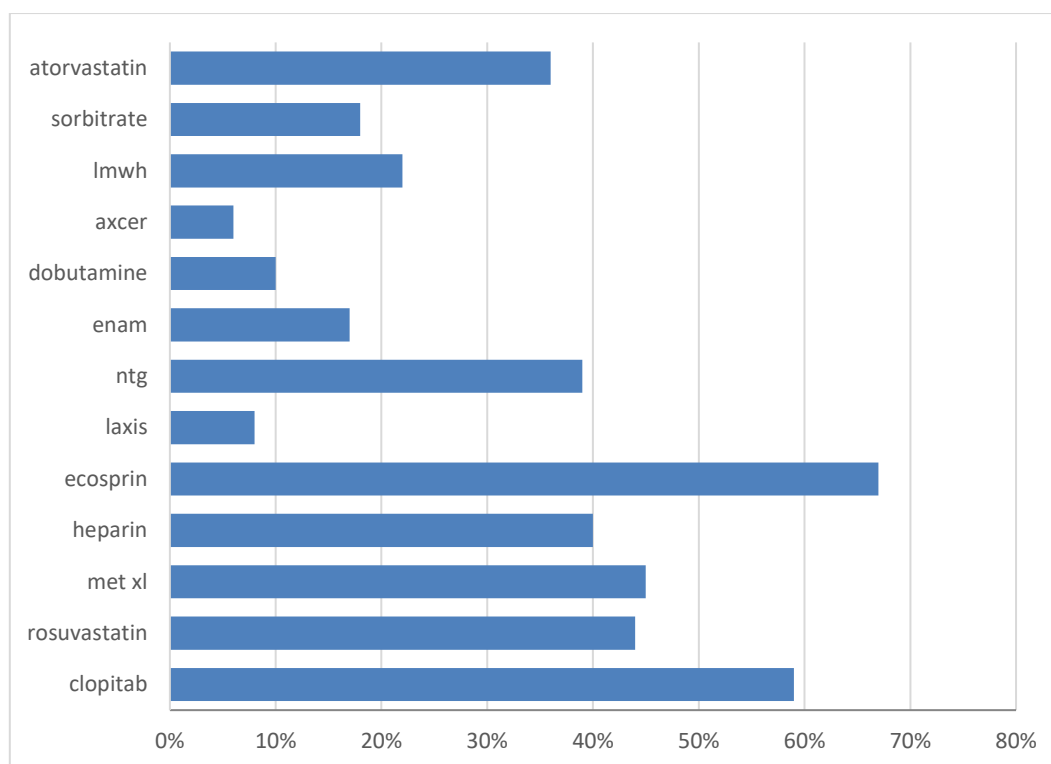
Fig no 9: PATTERN OF DRUGS IN SPECIES ACCORDING TO THEIR FREQUENCY

PATTERN OF COMPLICATIONS IN CARDIOVASCULAR PATIENTS

Among the data collected out of total individuals' patients with HYPERTENSION are found to be 120 with 60%, ANGINA are found to be 22 with 11%, CORONARY ARTERY ABNORMALITIES are found to be 3 with 1.5%, MYOCARDITIS are found to be 7 with 3.5%, CARDIAC FIBROSIS are found to be 2 with 1%, CARDIOMYOPATHY are found to be 3 with 1.5%, HEART FAILURE are found to be 25 with 12.5%, SYSTEMIC ARTERY ANEURYSMS are found to be 3 with 1.5 ,ENDOTHELIAL DYSFUNCTION are found to be 6 with 3% and DEATH are found to be 10 with 5%. Results are shown in the below table.

COMPLICATIONS	NO.OF. PATIENTS	PERCENTAGE
HYPERTENSION	120	60%
ANGINA	22	11%
CORONARY ARTERY ABNORMALITIES	3	1.5%
MYOCARDITIS	7	3.5%
CARDIAC FIBROSIS	2	1%
CARDIOMYOPATHY	3	1.5%
HEART FAILURE	25	12.5%
SYSTEMIC ARTERY ANEURYSMS	3	1.5%
ENDOTHELIAL DYSFUNCTION	6	3%
DEATH	10	5%

TABLE NO.10: PATTERN OF COMPLICATIONS IN CARDIOVASCULAR PATIENTS
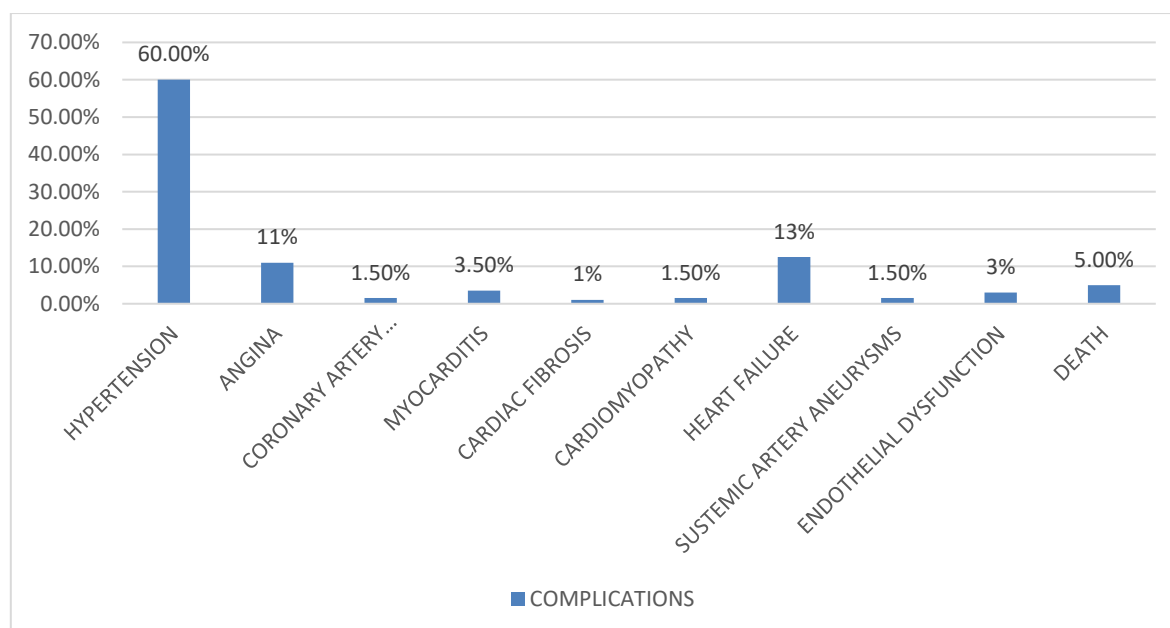
Fig no 10: PATTERN OF COMPLICATIONS IN CARDIOVASCULAR PATIENTS

DISCUSSION

Cardiovascular diseases stand as the leading causes of mortality in developed nations, and their incidence is swiftly escalating in developing regions. Over time, significant connections have been observed between non-O blood group status and heightened susceptibility to certain cardiovascular disorders. Recent Genome-Wide Association Studies (GWASs) have pinpointed the ABO locus as a significant factor in thrombosis, myocardial infarction, and several other cardiovascular risk indicators. This renewed focus underscores the importance of understanding underlying mechanisms and the potential for advancements in clinical interventions. [12]

Extensive research efforts worldwide have delved into the origins and development of cardiovascular diseases. The etiological landscape may vary across different regions, underscoring the importance of exploring and analyzing experiences from diverse geographical areas. While numerous factors contributing to heart disease have been identified, there remains a crucial need for further evaluation of this condition, given its substantial impact on morbidity and mortality. [13]

Our study was undertaken at Khammam district head quarters hospital, Khammam, to study cardiovascular diseases, and compare regarding the blood groups. In our study we are taken 200 patients in the period of 6 months. 61 patients of blood group B (+) have been highest among other blood groups.

We studied total 200 patients admitted in the hospital. Each patient was study in detailed with clinical history, examination, laboratory investigations, personal history of alcohol, past medical and medication history, ultra sound examination results and management of cardiovascular disease information was recorded and documented.

We have followed up patients day by day up to 7 to 10 days or up to discharge. We have recorded all the sign and symptoms that patient experienced, laboratory investigations, ultra sound examinations, blood grouping and also the medications given for the management of cardiovascular disease was noted up to discharge.

CONCLUSION

In the present study, an attempt has been made to find out whether there exists any relationship between blood groups and the risk for cardiovascular disease based on 200 subjects form Khammam district of Telangana. The mean values of systolic and diastolic blood pressures were elevated

among individuals in the B blood group, while AB blood group subjects exhibited higher mean levels of serum lipids (total serum cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol) compared to individuals in other blood groups. Rh (D) positive individuals had higher blood pressure and lower serum lipids levels. The prevalence of risk status was higher in individuals with B blood group than in Rh (D) positives. Findings of this study suggest that B blood group individuals have more susceptibility for CARDIOVASCULAR DISEASES indicating a potential genetic association between ABO blood group and hypertension. Further studies are essential in larger population to more clearly elucidate these results.

REFERENCES
1. Medically reviewed by Dr. Payal Kohli, M.D., FACC - By Mathieu Rees on May 30, 2022 (https://www.medicalnewstoday.com/articles/257484)
2. Nichols M, Townsend N, Scarborough P, Rayner M. Cardiovascular disease in Europe 2014: epidemiological update. European heart journal. 2014 Nov 7;35(42):2950-9.
3. Mendis S, Puska P, Norrving BE, World Health Organization. Global atlas on cardiovascular disease prevention and control. World Health Organization; 2011.
4. World Health Organization. Cardiovascular diseases (CVDs). (https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds))
5. American Association of Neurological Surgeons. Cerebrovascular Disease (https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Cerebrovascular-Disease).
6. British Heart Foundation-symptoms and risk factors (https://www.bhf.org.uk/informationsupport/conditions/cardiovascular-heart-disease)
7. National Health Service (https://www.nhs.uk/conditions/cardiovascular-disease/#:~:text=If%20you%20don't%20exercise,you%20maintain%20a%20healthy%20weight)
8. Bays HE. Ten things to know about ten cardiovascular disease risk factors ("ASPC Top Ten–2020"). American journal of preventive cardiology. 2020 Mar 1; 1:100003.
9. Centres for Disease Control and Prevention. 2020. Overweight & obesity. Adult obesity facts (https://www.cdc.gov/obesity/data/adult.html).
10. Mayo clinic, heart-diseases/heart condition (https://www.mayoclinic.org/diseases-conditions/heart-disease/symptoms-causes/syc-20353118)
11. National institute of health (https://www.nhlbi.nih.gov/health/stroke/symptoms).
12. National centre for biotechnology information, ABO blood group associated with CVD (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3485501/).
13. Curry SJ, Krist AH, Owens DK, Barry MJ, Caughey AB, Davidson KW, Doubeni CA, Epling JW, Kemper AR, Kubik M, Landefeld CS. Risk assessment for cardiovascular disease with nontraditional risk factors: US preventive services task force recommendation statement. JAMA. 2018 Jul 17;320(3):272-80.

******