***International Journal of Biomedical and Advance Research***
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: https://doi.org/10.7439/ijbar
CODEN: IJBABN **Original Research Article**

# Prevalence, Risk factors and current prospectus of treatment management of hypertension including obese patients in Jessore, Bangladesh

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***Article History:**
**Received:** 25/09/2017
**Revised:** 28/09/2017
**Accepted:** 12/10/2017
**DOI:** https://doi.org/10.7439/ijbar.v8i10.4414

## Abstract

**Background/Objectives:** Cardiovascular disease (CVD) is the most concerning disease in health sectors, whole over the world. Some environmental parameters and physical condition affect on the cardiac health. We therefore observed a cross sectional study of cardiac health condition and analysis to effect risks factors study.
**Methods:** This cross sectional study was performed on hypertensive patients with their treatment managements. Study area, study population & sample and data collection were well performed by informative questionnaires. Significance of variants data was analyzed considering $p<0.05$ by SPSS software.
**Results:** This estimated hypertensive patient's data was 25.4% female and 74.6% male. 36 to 50 years holdings patients was to be highest, containing 43.8% and their systolic pressure (Mean ±SD) was 143.15±10.51. Age depending Odds Ratio [confidence interval] for 60 up age patients was 1.996[0.756 - 5.269]. Consideration of BMI index the Odds Ratio (confidence interval) of obese patients was 6.258(2.595 - 15.088). Most choice of treatment managements of hypertensive patients was angiotensine receptor blockers. With hypertension some cardiovascular complication were to be occurred , in these condition some combination drugs were to be referred, most choice of drugs was angiotensine receptor blockers and diuretics combination preparation.
**Conclusion:** Population based cross sectional study in Jessore region was to be estimated cardiovascular diseases and screen out informative knowledge of hypertensive risk factors.
**Keywords:** Hypertension, Risk issues, Treatment management, Obesity.

## 1. Introduction

Cardiovascular disease (CVD) is the class of disease which occurs due to impaired heart function, considers one of the major health problems in the world responsible for 30% of all global deaths. Cardiovascular diseases (CVD) constitute a major public health problem in world accounting 30% of all global deaths [1]. The rapidly increasing CVD death toll is predicted to rise to 23 million by 2030 [2]. More importantly, CVD, once regarded as diseases of affluence, is now wildly spreading among low and middle income countries contributing more than three-quarters of all CVD deaths in the globe [3]. It is emerging as a major killer even in Bangladesh.

Most cardiovascular diseases share common risk factors like tobacco use, physical inactivity, unhealthy diet,

harmful use of alcohol, diabetes, high blood pressure and raised lipid. Among them, behavioral risk factors-unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol, alone contribute 80% of coronary heart disease and cerebrovascular disease [1]. Smoking is estimated to cause nearly ten per cent of all CVD followed by physical inactivity (6%), and overweight and obesity (5%) [4]. Recent studies have reported high prevalence of behavioral related CVD risk factors in Bangladesh [5,6]. National NCD risk factors survey 2013 detected considerably high proportions of smoking (18.5%), alcohol consumption (17.4%), and obesity (4%) among Bangladeshi [7].

Knowledge of modifiable risk factors (smoking, lack of exercise, obesity and consumption of fatty foods) for heart diseases has been identified as a prerequisite for change in behavior and is often targeted by prevention programs [8,9]. Although knowledge alone is insufficient, it is assumed to be a key component of behavioral change and decision making [10]. Estimating the level of knowledge of the population at large as well as those suffering from CVD can help to guide public health programs especially those directed towards reducing modifiable risk factors for CVD. Earlier studies have revealed that education programs for the elderly were effective in improving health promotion knowledge and behaviors [11, 12].

The level of education is one of the predictors of knowledge of healthy life styles. The traditional extended family household may not be as updated in current knowledge as a nuclear family household because of a more orthodox attitude to health beliefs.

A study on the risk factors for heart disease has shown that tobacco use, ghee (clarified butter) intake, raised fasting glucose, high cholesterol, paternal history of CVD, low income, and low levels of education are associated with premature myocardial infarction in Pakistan [13]. A more recent study on the risk factors for heart disease has shown that tobacco use, habit of salt intake, high cholesterol, paternal history of CVD, low income, less physical activity, alcohol consumption, obesity, diabetes and low levels of education are associated with cardiovascular disease in Rajshahi division of Bangladesh [14]. However this study is not sufficient enough to identify proper data on risk factors concerning CVD all over the country. Such kinds of more studies are time's call. Therefore, the present study aimed to evaluate the extent of CVDS risk factors, medications, pathological status, habits and socio-economic status with more detailed data & to suggest possible ways to overcome the load of cardiovascular diseases.

## 2. Methods and Materials

### 2.1 Study Area and study Design

We performed a retrospective, cross-sectional study during 10 January, 2017 to 15 May, 2017 in Jessore city of Bangladesh. In our survey, total 425 hypertensive patients (both indoor and outdoor patients) were investigated aged 19 years to more than 60 years. In these investigation, we observed 108 female and 317 male patients by presenting the major diagnostic centers (Ibna Sina Diagnostic center, Lab scan Diagnostic center, Doratana Diagnostic Center) and hospital (Jessore medical college and Hospital, Bangladesh) around the area of study.

### 2.2 Study population

The overcast population consisted of patients who were hospitalized in medical or surgical coronary unit. Patient's written consent was taken before participating to interviews. We consulted with the patients and their relatives who are taken care of them.

### 2.3 Samples and Data Collection

During data collection, we prepared a data collection form with some standard questionnaires regarding risks factor and treatment of Hypertension and associated complications. The data were collected from cooperation with patients, patient's relatives, physicians and other pathologists. Some geo-demographic, psychographic and disease complication information (such as area, age, gender, height, weight, income, awareness, diabetes mellitus, surgery, cholesterol, dietary food habits, alcohol intake, smoking condition) were collected.

### 2.4 Statistical Analysis

The data were analyzed using Microsoft Excel (2013 addition) and the Statistical Package for Social Sciences (SPSS) software (Version 16.0) (SPSS, Inc., Chicago, IL).

## 3. Results

From the total data of 425 patients are included in the final processing data analysis. The distribution based on geo – demographic, psychographic, disease complication status such as income, gender, area, age, awareness, physical activities, smoking, alcohol intake and some other health issues are analyzed here. About 73 (17.2%) and 352 (82.8%) study population are rural and urban area in respectively. There are 108 (25.4%) female and 317 (74.6%) male. In Jessore regions more are come from urban area. About 50% (43.8%) hypertension patients are 36 to 50 years old containing aged. In this survey all types of income level subjects are obtained, most are in 30001Tk to 50000 Tk ranges, which are 33.6% in total. Body mass index (BMI) are important issue that are affect on the hypertension patients that are four category normal, underweight, overweight and obesity in about 7.8%, 33.4%, 28.5%, 30.4% in respectively.[Table 1]

**Table 1: Geo-demographic risk factors of the study population (Hypertension patients) in Jessore, Bangladesh**

| Parameters | Condition | Frequency [N] | Percentage (%) |
|---|---|---|---|
| Area | Rural | 73 | 17.2 |
| | Urban | 352 | 82.8 |
| Age(Year) | 15-35 | 53 | 12.5 |
| | 36-50 | 186 | 43.8 |
| | 51-60 | 114 | 26.8 |
| | >60 | 72 | 16.9 |
| Gender | Female | 108 | 25.4 |
| | Male | 317 | 74.6 |
| Income(BDT) | 10000-30000 | 63 | 14.8 |
| | <10000 | 98 | 23.1 |
| | 30001-50000 | 143 | 33.6 |
| | >50000 | 121 | 28.5 |
| BMI(Kg/m2) | Normal(18.8-24.9) | 33 | 7.8 |
| | Under(<18.8) | 142 | 33.4 |
| | Overweight(25-29.9) | 121 | 28.5 |
| | Obese(>29.9) | 129 | 30.4 |

In Jessore region basically male patient was taken smoking and drank alcohol, female patient was not done. In study population 163 (38.4%) patients of 425 patients did smoking and 62 (14.6%) patients drank alcohol. In dietary food condition fruit and vegetables took 178 (41.9%), fast food took 136 (32%), confectionary food took 111 (26.1%) in patients. Whole study population 253 (59.5%) patients was wared to hypertension condition but 172 (40.5%) was not alerted. In daily routine physical exercise had done or less; generally exercise range 31 minutes to 60 minutes per day of patients was high and amounted in 207 (48.7%). About 30 (7.1%) patients had done above 60 minutes per day in exercise. [Table 2]

**Table 2: Psychographic risk factors of the study population (Hypertension patients) in Jessore, Bangladesh**

| Parameters | Condition | Frequency [N] | Percentage (%) |
|---|---|---|---|
| Smoking | No | 262 | 61.6 |
| | Yes | 163 | 38.4 |
| Alcohol | No | 363 | 85.4 |
| | Yes | 62 | 14.6 |
| Dietary food | Fruit & vegetables | 178 | 41.9 |
| | Fast food | 136 | 32.0 |
| | Confectionary food | 111 | 26.1 |
| Awareness | No | 172 | 40.5 |
| | Yes | 253 | 59.5 |
| Physical activities (min/day) | 0-30 min/day | 188 | 44.2 |
| | 31-60 min/day | 207 | 48.7 |
| | >60 min/day | 30 | 7.1 |

In the study population 289 (68%) patients are involved with diabetes mellitus (DM) disorder, other are free from. Those are diabetes mellitus patients, which are some Types 1 DM and some Types 2 DM but most are types 2 DM patients. 281 (66.1%) patients were containing in high cholesterol level, where 253 (59.5%) patients are known or knowledge about hypertension. In total survey 70 (16.5%) patients were hypertensive patients that had involved with surgery. in contrast we observed in patients condition that 25.4% was normal and 74.6% was hypertensive condition [Table 3].

**Table 3: Disease complication with the study population (Hypertension patients) in Jessore, Bangladesh**

| Parameters | Condition | Frequency [N] | Percentage (%) |
|---|---|---|---|
| Diabetes | No | 136 | 32.0 |
| | Yes | 289 | 68.0 |
| Hypertension | Normal | 108 | 25.4 |
| | Hypertensive | 317 | 74.6 |
| Cholesterol | Normal | 144 | 33.9 |
| | High | 281 | 66.1 |
| Surgery | No | 355 | 83.5 |
| | Yes | 70 | 16.5 |

In study population, diastolic pressure and systolic pressure were raised in most age range 36 years to 50 years [Table 4] and male patients had more diastolic pressure and systolic pressure [Table 5].

**Table 4: Age-specific distribution of mean diastolic pressure (mmHg) and systolic pressure (mmHg) among the study population in Jessore, Bangladesh**

| Age (Years) (n) | Diastole (Mean±SD) | P value | Systole (Mean±SD) | P value |
|---|---|---|---|---|
| 15-35 [53] | 90.19±10.00 | 0.423 | 142.55±11.79 | 0.794 |
| 36-50 [186] | 91.34±8.84 | | 143.15±10.51 | |
| 51-60 [114] | 90.09±8.52 | | 142.24±11.94 | |
| above 60 [72] | 89.58±7.95 | | 141.75±9.45 | |

Mean ± Standard Deviation (SD).P < 0.05 by One way ANOVA

**Table 5: Sex-specific distribution of mean systolic pressure (mmHg) and diastolic pressure (mmHg) among the study population in Jessore, Bangladesh**

| Gender [N] | Diastole (Mean±SD) | P value | Systole (Mean±SD) | P value |
|---|---|---|---|---|
| Female [108] | 88.47±8.47 | 0.979 | 139.78±11.03 | 0.556 |
| Male [317] | 91.28±8.76 | | 143.55±10.69 | |

Mean ± Standard Deviation (SD).P value calculated by Independent t- test.

In multiple logistic regressions analysis carried out the odds ratio (OR) of various potential or significance variables or risks factors (gender, age, income, usual residence, smoking, alcohol intake, diabetes, cholesterol, awareness, physical activities) with 95% confidence interval (CI). The odds ratio (95% confidence interval) of Area urban was 0.440(0.205 - 0.943). The OR(95% CI) of Age 36-50 and BMI Obese were 1.092(0.413 - 1.928) and 6.258(2.595 - 15.088). High value of odds ratio had responsible for high risk for hypertension and low value of odds ratio had indicate better significance to aware about hypertension.

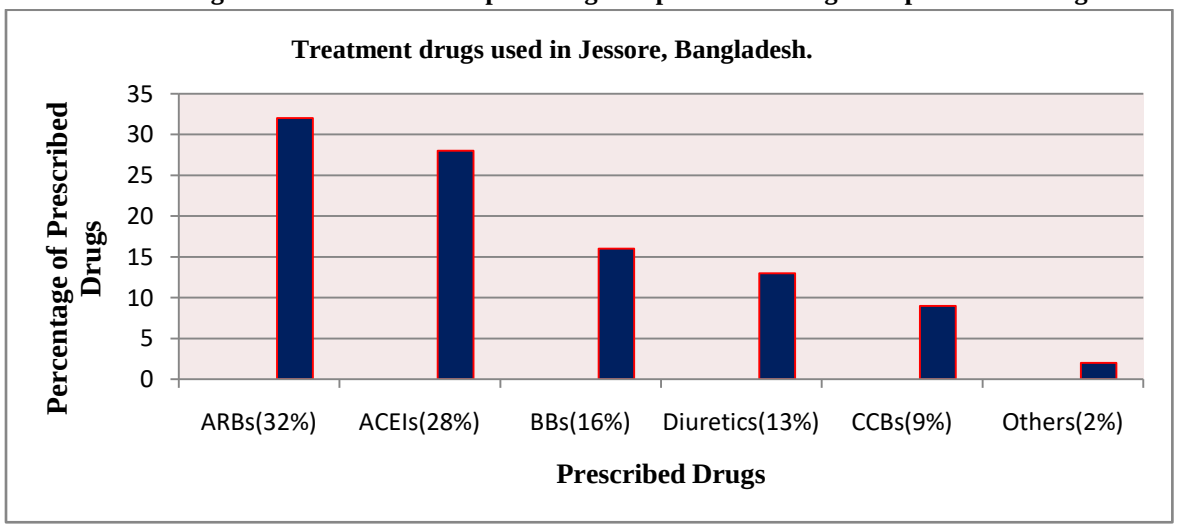
**Table 6: Crude odds ratio (with 95% confidence intervals) of individual risk factors influencing prevalence of hypertension in Jessore, Bangladesh**

| Variables | Condition | OR(95% CI) |
|---|---|---|
| Area | Rural* | 1 |
| | Urban | 0.440(0.205 - 0.943) |
| Age | 15-35* | 1 |
| | 36-50 | 1.092(0.413 - 1.928) |
| | 51-60 | 1.505(0.802 - 3.640) |
| | >60 | 1.996(0.756 - 5.269) |
| Gender | Female* | 1 |
| | Male | 1.944(1.084 - 3.487) |
| Income | 10000-30000* | 1 |
| | <10000 | 1.235(0.551 - 2.769) |
| | 30001-50000 | 0.816(0.563 - 2.027) |
| | >50000 | 1.095(0.493 - 2.431) |
| BMI | Normal* | 1 |
| | Under | 4.516(1.924 - 10.597) |
| | Over | 5.094(2.150 - 12.069) |
| | Obese | 6.258(2.595 - 15.088) |
| Diabetes | NO* | 1 |
| | Yes | 1.532(0.931 - 2.520) |
| Smoking | No* | 1 |
| | Yes | 1.049(0.589 - 1.867) |
| Alcohol | No* | 1 |
| | Yes | 1.858(0.830 - 4.162) |
| Dietary food | Fruits and vegetables* | 1 |
| | Fast food | 1.332(0.752 - 2.359) |
| | Confectionary food | 1.162(0.645 – 2.091) |
| Awareness | No* | 1 |
| | YES | 0.679(0.412 - 1.117) |
| Physical activity(minutes) | 0-30 min* | 1 |
| | 31-120 min | 0.847(0.513 - 1.399) |
| | >120 min | 0.998(0.371 - 2.685) |
| Cholesterol | No* | 1 |
| | Yes | 1.409(0.862 - 2.302) |
| Surgery | No* | 1 |
| | Yes | 1.639(0.813 - 3.305) |

*: Reference category. Results are presented as odds ratio (OR), with 95% confidence intervals (95% CI) in parentheses. In description, Variables data are expressed as variables Condition.

In our retrospective cross-sectional study, we observed that basically physician were prescribed drug or medicine in hypertension as angiotensin II receptor blockers (ARBs) were 32%, angiotensin converting enzyme inhibitors (ACEIs) were 28%, beta blockers were 16%, diuretics were 13%, calcium channel blockers were 9% and others hypertension inhibitors drugs were 2% [Fig 2].

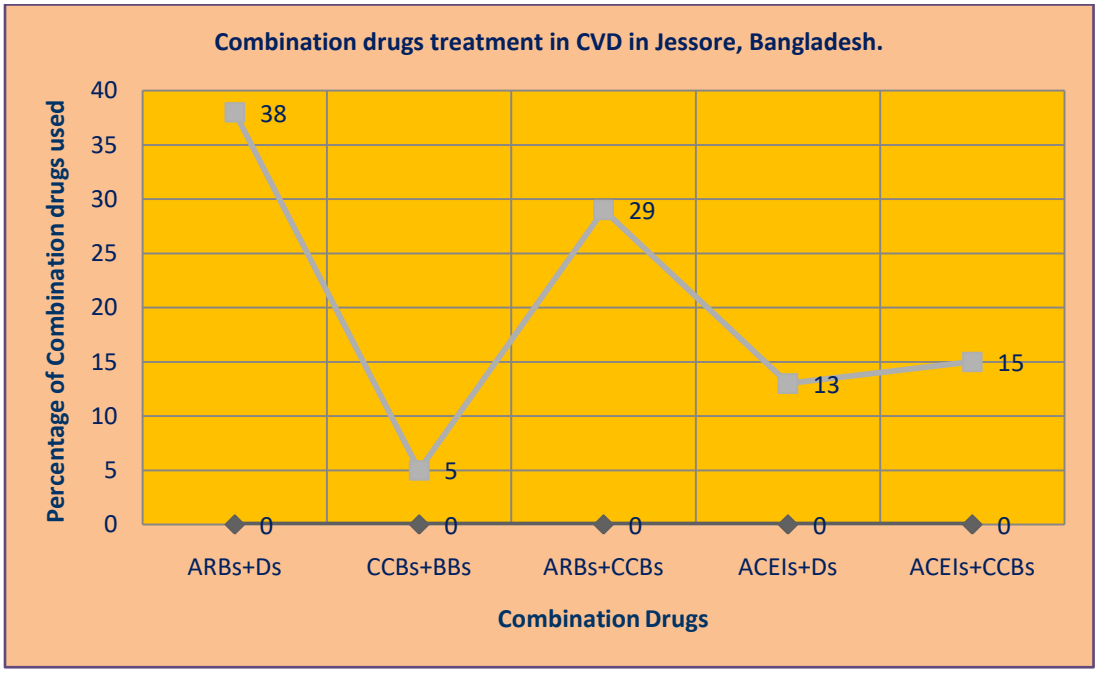
**Fig 1: Line chart between percentages of prescribed drugs and prescribed drug**




[ARBs= Angiotensin II receptor blockers, ACEIs= Angiotensin converting enzyme inhibitors, BBs= Beta blockers, CCBs= Calcium channel blockers, others= Alpha blockers and Cardiac activity maintaining drugs].

We also observed that in the situation of complication of hypertension, here are generally occurred others cardiovascular complication (such as angina pectoris, supraventricular arrhythmias, paroxysmal supraventricular tachycardias, cardiac arrhythmias, myocardial infraction and it's related complication) with hypertension in patients who were treated by physician prescribed combination drugs. ARBs and Ds combination drugs were most choiced to prescribed in 38%, CCBs and BBs combination were 5%, ARBs and CCBs combination were 29%, ACEIs and Ds combination were 13% and ACEIs and CCBs combination were 15% [Fig. 2].

**Fig. 2: Percentage of combination drugs used to cure hypertension with its related complication of cardiovascular disease**




[ARBs= Angiotensin II receptor blockers, ACEIs= Angiotensin converting enzyme inhibitors, BBs= Beta blockers, CCBs= Calcium channel blockers, Ds= Diuretics].

## 4. Discussion

The purpose of our current study was to determine the prevalence and risk factors of hypertension in Jessore region in Bangladesh. The various review studies estimated a prevalence rate of hypertension in Bangladesh ranging from 16-34%.[15] In contrast, due to different study population, different cut-off values in determining the position of hypertension among the study population. Our study results, the highest prevalence of hypertension were 43.8% on the age basis findings. Therefore these prevalence are varied on varies of physical and environmental factors, are not maintaining too gradually.[19] Basis on BMI, the prevalence were obtaining 33.4% in obese patients. The prevalence of BMI knowing is important to maintaining the exact position of risks platform of hypertension in Bangladesh.[16]

In our study we observed 425 patients where 74.6% were male and 25.4% were female patients. Anatomically male and female are differ from each others, in female body hormonal and enzyme effect more than male. In Bangladesh male suffer high social stress in works than female. Gender variations are highly emphasis on the cardiovascular diseases that are lightly involved on the basis of mechanism and mechanical stress of our body function.[16-18] Physical activity and ability of body physiology depend on age level; during old ages, ability to work metabolism activity of body physiology can not work as normal stage.[19] In risk factors age, above 60 age patients were more risk stage than other ages but number of patients were high in 36 to 50 ages. Basically in old age, every cell in our body is not susceptible to maintain our body fluid. Increasing ages, our life styles have changed in habitually. Life style depends on environment, responsible livelihood, habit, culture, health, awareness and such as.[20] It must be changeable between male and female; these condition vary gender basis need and requirement to spend life. In our study female patients were free from smoking and alcohol taking. Life style are major factors for these disease, whose take alcohol, smoking.[19,21] Alcohol taking and smoking patients were more risk stage than none. Excessive taking alcohol damage our body cell activity, at these how our cardiac muscles has been damaged and not to supply efficient oxygen in our whole body. Smoker body muscle contains much nicotines that are highly harmful for lungs which work synchronous with heart by exchanged oxygen and carbon dioxide. Oxygen and carbon dioxide flow depend on body situation. During exercise, oxygen demands of our body are increased. Walking, jogging and playing are more impact on our physiological parameters and activity. These exercises stimulate our body organs and glands that have sophisticated activities on desire organ. Those patients were done sufficient physical exercise (31-60 min/day), those were less risk stage of hypertension. Oxygen circulation increase during exercises is the best activity to reduce the risk of hypertension. In Bangladesh some people do not exercises, those people are seriously targeted on complication of coronary heart diseases. We must consider taking our daily food basis on BMR index and daily labor of our body. Selection of foods in daily meal is more important; alkaline food, acidic food, fatty food, carbohydrates, proteins maintain our body activities and our energy supply.[22] Food taking and awareness to cardiovascular risk issue are also responsible to maintain cardiovascular disease.[23] Awareness people much conscious their body need, want and demand. Taking decision against any disease or disorder is much precise in awareness people. Fast food, confectionary food and high cholesterol food taking patients were more risk stage in hypertension.[22,23] High cholesterol level is highly diminishing our cardiac activity. Cholesterol containing food increases cholesterol level. In Bangladesh, rural people eat less cholesterol containing food than urban people. Diabetes is a disorder that is highly responsible on insulin hormone, maintain the blood sugar level, impact on surgery.[24] These regulations are highly dependent on each other. Those patients had contained diabetes and surgery that were highly risk stage in hypertension. If we will maintain on food selection basis on BMI, we free from cardiovascular diseases or others diseases. We strongly observed in our survey that BMI were highly impact on hypertension, overweight and obesity patients were strongly high risk stage in hypertension. After some days or one day per month we should go to the physician to consult maintaining our health.

Current prospectuses in Jessore region were varying to patient's condition and physician choices. For hypertension patients, single drug were first choice by physician. Many physician choice single drugs supplements because they thought that single drug has less adverse effect. In these single drugs, angiotensin receptor blockers (ARBs) and angiotensin converting enzyme inhibitors (ACEIs) were first choice, then beta blockers (BBs), Diuretics and others drugs. But in case of hypertensive emergencies patients has been provided diuretics by physician to treat it.[25] Having other heart disease complication with hypertension their choice to need prescribed combination drugs by physicians. Angiotensin receptors blockers and diuretics combination drugs, angiotensin receptors blockers and calcium channel blockers combination drugs were the first choice for other heart disease complication with hypertension,[20] basically that choice were responsible on the experience of physician and physician motive. Physicians also think that these two combination drugs are more effect than other combination

drugs.[26] Then other combination drugs choice were angiotensin converting enzyme inhibitors (ACEIs) and calcium channel blockers (CCBs), angiotensin converting enzyme inhibitors (ACEIs) and diuretics, calcium channel blockers (CCBs) and beta blockers (BBs).[25,26] To provide or select combination drugs, cardiac disease management knowledge, drug dose regimen, drug-drug interaction and pregnancy category must be considerable.

To reduce or prevent the risk of hypertension (or its related complication) we need to maintain our daily routines (physical and mental activity, taking food) that are significance maintaining of action of heart. To find out risk issues of cardiovascular disease and to know their maintaining process or purposes that maintain our heart. Therefore, we will maintain our geo-demographic and psychographic risk factors for cardiovascular diseases; we must improve our heart life.

## 5. Conclusion

This research adds new dimensions to population-based cardiovascular health research in Bangladesh. In a setting where cardiovascular health research has traditionally been limited to the estimation of risk factor burden, the findings presented here widen the research arena by encompassing psychosocial aspects of cardiovascular health and investigating links between cardiovascular health knowledge, attitude, literacy, and behavior. Similarly, this project provides a deeper exploration of the socio demographic aspects of behavioral risk factors (e.g., physical activity and fruit and vegetable consumption). It is obvious from our study that in Bangladesh though there are educated people but there are still some lacking of knowledge concerning cardiovascular disease among both city and rural population. Therefore social awareness should be developed among people of Bangladesh especially in rural community through educational programs & by print/visual media. The health ministry of Bangladesh in co-operation with vast media and other concerned humanitarian corporations should take necessary measures to build up awareness among people about the balanced diet, food habit & physical exercise through health campaign. Moreover health professionals can also play an important role through making a good relationship with their patients and make them understand about these risk factors concerning cardiovascular disease and how to fight this disease in emergency situations.

## Acknowledgement

The authors gratefully acknowledge the contribution of Professor Dr. Niranjan Kumar Sana, Department of Biochemistry & Molecular Biology, Rajshahi University to the study participants for their valuable time and assistance.

## Conflicts of Interest

We declare that we have no conflict of interest between the authors.

## References

[1]. World Health Organization Global Status Report on Non-Communicable Diseases 2010. WHO, Geneva, 106.2011.

[2]. Mathers CD, Loncar D: Projection of global mortality and burden of diseases from 2002 to 2030. *PLoS Med*. 2006; 3:e442.

[3]. World Health Organization: The World Health Report: 1999: Making a Difference: Massage from the Director-General.1999.

[4]. Mendis S, Puska P, Norrving B: Global Atlas on Cardiovascular Disease Prevention and Control. Geneva, Switzerland: World Health Organization; 2011.

[5]. Sharma SK, Ghimire A, Radhakrishnan J, Thapa L, Shrestha NR, Paudel N, Gurung K, Budathoki A,Baral N,Brodie D: Prevalence of hypertention,obesity, diabetes and metabolic syndrome in Nepal. *Int J hypertens* 2011;821971.

[6]. Ministry of Health and Family Welfare Government of the people's Republic of Bangladesh, Bangladesh Society of Medicine, N.C.D and WHO: WHO STEPS Surveillance: Non-Communicable diseases Risk Factory Survey 2010:17-25.

[7]. World Health Organization, Bangladesh Health Research Council: Non Communicable Diseases Risk Factor, STEPS Survey 2013 Bangladesh, Fact sheet.2013.

[8]. Potvin L, Richard L, Edwards AC: Knowledge of cardiovascular disease risk factors among the Canadian population: relationships with indicators of socioeconomic status. *CMAJ*. 2000, 162 (9 Suppl): S5-11.

[9]. Bani IA, Hashim TJ: Knowledge of nutrition and coronary heart disease in Riyadh, Saudi Arabia. *J Community Health*. 1999, 24 (6): 467-473.

[10]. Ford ES, Jones DH: Cardiovascular health knowledge in the United States: findings from the National Health Interview Survey, 1985. *Prev Med.* 1991, 20 (6): 725-736.

[11]. Huang LH, Chen SW, Yu YP, Chen PR, Lin YC: The effectiveness of health promotion education programs for community elderly. *J Nurs Res.* 2002, 10 (4): 261-270.

[12]. Kirk-Gardner R, Steven D: Hearts for Life: a community program on heart health promotion. *Can J Cardiovasc Nurs*. 2003; 13 (1): 5-10.

[13]. Ismail J, Jafar TH, Jafary FH, White F, Faruqui AM, Chaturvedi N. Risk factors for non-fatal myocardial infarction in young South Asian adults. *Heart.* 2004; 90:259–263.

[14]. Haque *et al*.; Impact of Socioeconomic and Risk Factors on Cardiovascular Diseases among People in Bangladesh: A Cross-sectional Health Survey *BJPR*. 2017;15(2): 1-8.

[15]. Edwards R, Unwin N, Mugusi F, Whiting D, Rashid S *et al*. Hypertension prevalence and care in an urban and rural area of Tanzania. *J Hypertens.* 2000; 18:145-52.

[16]. Masuma AK, Wietze L, Abdur R *et al*. Prevalence and determinants of pre-hypertension and hypertension among the adults in rural Bangladesh: findings from a community-based study. *BMC Public Health* 2015;15:203

[17]. Singh RB, Beegom R, Ghosh S, Niaz MA, Rastogi V *et al*. Epidemiological study of hypertension and its determinants in an urban population of north India. *J Hum Hypertens*. 1997; 10:679-85.

[18]. Whelton PK. Epidemiology of hypertension. *Lancet.* 1994; 344:101-6.

[19]. Zaman MM, Rouf MA. Prevalence of hypertension in a Bangladeshi adult population. *J Hum Hypertens.* 1999; 13:547-9.

[20]. Méndez-Chacón E, Santamaría-Ulloa C, Rosero-Bixby L. Factors associated with hypertension prevalence, unawareness and treatment among Costa Rican elderly. *BMC Pub Health.* 2008; 8:275.

[21]. Bhowmik B, Munir SB, Diep LM, Siddiquee T, Habib SH *et al*. Anthropometric indicators of obesity for identifying cardiometabolic risk factors in a rural Bangladeshi population. *J Diabetes Invest.* 2013; 4:361–8.

[22]. Howard B, Wylie-Rosett J. Sugar and cardiovascular disease: A statement for healthcare professionals from the Committee on Nutrition of the Council on Nutrition, Physical Activity, and Metabolism of the American Heart Association. *Circulation;* 2002;106: 523-527.

[23]. Dong Z, Yue Q, Zheng Z, Ying W, Xiu-Ying Z *et al*. Dietary factors associated with hypertension. *Nature Rev Cardiol.* 2011; 8:456-65.

[24]. Saquib N, Khanam MA, Saquib J, Anand S, Chertow GM *et al*. High prevalence of type 2 diabetes among the urban middle class in Bangladesh. *BMC Public Health.* 2013; 31(13):1032.

[25]. Wang D, Liu MM, Lin Q, Meng XJ, Xu LX, Hou H *et al*. Factors associated with prevalence, awareness, treatment and control of hypertension in urban adults from 33 communities in China: the CHPSNE study. *Hypertens Res*. 2011; 34:1087-92.

[26]. Pauline E. Osamor1 and Bernard E. Owumi. Factors associated with treatment compliance in hypertension in Southwest Nigeria. *J Health Popul Nutr.* 2011; 29:619-28.