Analysis of Risk Factors of Non-Communicable Diseases among Female population of Dhaka City

A Project Report to be submitted in the Department of Pharmacy, East West University, in the Partial Fulfillment of the requirements for the degree of Master of Pharmacy

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DECLARATION BY THE RESEARCH CANDIDATE

I, Khadizatul Kobra, ID: 2014-3-79-029, hereby declare that the dissertation entitled **"Analysis of Risk Factors of Non-Communicable Diseases among Female population of Dhaka City''** submitted to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the degree of Master of Pharmacy is a genuine & authentic research work carried out by me. The contents of this dissertation, in full or in parts, have not been submitted to any other institute or University for the award of any degree or Diploma of Fellowship.

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CERTIFICATION BY THE SUPERVISOR

This is to certify that the dissertation, entitled **"Analysis of Risk Factors of Non-Communicable Diseases among Female population of Dhaka city"** is a bonafide research work done by Mst.Khadizatul Kobra, (ID: 2014-3-79-029), in partial fulfillment of the requirement for the degree of Master of Pharmacy under my supervision.

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Dedicated to my beloved parents and honorable research faculty.

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List of Abbreviation

Abbreviation	Elaboration
BMI	Body mass index
DM	Diabetic mellitus
DALYs	Disability-adjusted life year
NCDs	Non-communicable diseases

Abstract

Non-communicable diseases (NCDs), also known as chronic diseases, are the leading cause of death globally. NCDs is rising rapidly and cause severe health problem. So, a study was conducted by face to face interview using a structured questionnaire on 329 female respondents in Dhaka city to know prevalence of NCDs, presence of behavioral and biological risk factors and awareness regarding this disease in Bangladesh. Majority of female respondents age limit in our study was 21-30 years. Majority, 89.67% were educated. The highest occupation of respondents is student (58.97%). Majority of hypertension (20.67%) and diabetes mellitus (11.25%). Family history of hypertension (38.30%), tobacco (smoking 42.25% & smokeless (12.16%) and DM (39.51%). In this study stage 1 hypertension (13.98%) and stage 2 hypertension (3.34%). Majority of obese respondents (.91%) and (15.81%) are overweight. Majority 44.98% never do any physical activity and (39.51%) female's physical activity is satisfactory. 43.16% females eating fruit is negative but majority (71.73%) females eating vegetable is positive for health. Majority (62.61%) female eating outside meals and (12.77%) female always add salt that is risk for our health. They can control their disease severity by maintain healthy body weight, eating sufficient fruit and vegetables, start physical activity, reduce fat, reduce salt and quit tobacco use. So from our study we find that, knowledge level of patients of our country is not prominent and needs to be improved. Although they know about risk factors of disease but they have lack of consciousness and do not obey them. So, some steps should be taken by the authority with the help of professionals to make them aware about NCDs.

Key words: Non-communicable disease, Female, Bangladesh, Risk factors.

Chapter 1
Introduction

1 Introduction

1.1 Overview:

Non-communicable diseases (NCDs) are disease processes that are not contagious or transferable from one human to another. Random genetic abnormalities, heredity, lifestyle or environment can cause non-communicable diseases, such as cancer, diabetes, asthma, hypertension and osteoporosis. Autoimmune diseases, trauma, fractures, mental disorders, malnutrition, poisoning and hormonal conditions are in the category of non-communicable diseases (Anderson, 2011)

The 4 main types of non-communicable diseases like heart attacks, cancers, chronic respiratory diseases and diabetes. NCDs are the leading cause of death globally (WHO, 2015).In 2012 they cause 68% of all deaths (38 million) up from 60% in 2000 (WHO, 2014).

The WHO's World Health Report 2002 identified five important risk factors for non-communicable disease in the top ten leading risks to health. These are raised blood pressure, raised cholesterol, tobacco use, alcohol consumption, and overweight. The other factors associated with higher risk of NCDs include a person's economic and social conditions, also known as the "social determinants of health."

Risk factors such as a person's background; lifestyle and environment are known to increase the likelihood of certain non-communicable diseases. They include age, gender, genetics, exposure to air pollution, and behaviors such as smoking, unhealthy diet and physical inactivity which can lead to hypertension and obesity, in turn leading to increased risk of many NCDs. Most NCDs are considered preventable because they are caused by modifiable risk factors. Every year at least 5 million people die because of tobacco use and 2.8million die from being overweight. High cholesterol accounts for roughly 2.6 million deaths and 7.5 million die because of high blood pressure (wikipedia.org, 2016).

1.2 Global Conditions of NCD

A new report published by the World Health Organization calculates that almost two-thirds of all worldwide deaths are now the result of non-communicable diseases. These mainly comprise cardiovascular diseases, cancers, diabetes and chronic lung diseases, and their epidemic. WHO is being driven by powerful forces now touching every region of

the world: demographic ageing, rapid unplanned urbanization, and the globalization of unhealthy lifestyles. The report also points out that, contrary to popular opinion, nearly 80% of deaths from non-communicable disease occur in low- and middle-income countries.

Among "best-buys" recommended by the WHO report at the population level are restrictions on smoking (sales and community bans), raised taxes on tobacco and alcohol, reduced salt in foods, the replacement of trans-fats with polyunsaturated fat, and public awareness about diet and physical activity.

Best-buys at the individual intervention level include counseling and multidrug therapy, including glycemic control for diabetes, and aspirin therapy for AMI.

The report estimates that the worldwide number of deaths attributable to non-communicable disease will increase by 15% between 2010 and 2020, with the greatest increases in Africa and South-East Asia. Most of these deaths will be associated with tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol. Tobacco use, for example, if unchecked will account for 10% of all deaths by 2010 (escardio.org, 2011).

In Bangladesh, one of the poorest countries in the region, the limited available evidence suggests that NCDs are responsible for half of annual mortality (51%), and almost half of the burden of disease (41%) .From 1986 to 2006, the major causes of death in Bangladesh gradually shifted from acute infectious and parasitic diseases to NCDs. Most recent estimates from 2006 indicate that NCD's represent 68 percent of total mortality while communicable diseases account for only 11 percent of total deaths. In Bangladesh, it is projected that the number of people with diabetes in Bangladesh will increase from 1.5 million in 2000 to 4 million in 2025. A recent household survey in Bangladesh estimated that tobacco-related illnesses were responsible for 16 percent of all deaths in the country (Bleich *et al*, 2011).

1.3 List of Non-communicable Diseases

Genetic diseases are caused by hereditary factors passed down by parents to children and also along extended generational lines. Chromosomal errors passed on to offspring result in a long list of recognized clinical diseases. Environmental diseases often are the result of the interplay between a combination of environmental exposures, lifestyle factors, diet and occupational hazards.

 There are many non-communicable diseases in this world. Some non- communicable diseases are given below:

Genetic Diseases

Achondroplasia, Albinism, Bardet-Biedl syndrome, Bipolar disorder, Canavan disease, Color blindness, Cystic fibrosis, Down's syndrome, Fragile X syndrome, Galactosemia, Hemophilia, Krabbe disease, Muscular dystrophy, Neurofibromatosis, Noonan syndrome, OsteogenesisPatau syndrome, Sickle-cell disease, Tay-Sachs disease, Triple X syndrome, Turner syndrome, Usher syndrome, Von Hippel-Lindau syndrome, Waardenburg syndrome, Wilson'sdisease, Xeroderma pigmentosum.

Environmental Diseases

Appendicitis, Anorexia nervosa, Arteriosclerosis, Asthma, Carpal tunnel syndrome, Chronic obstructive pulmonary diseases, Emphyema, Fetal alcohol syndrome, Glaucoma, Fibromyalgia, Hyperthyroidism, Hypothyroidism, Irritable Bowel Syndrome, Liver cirrhosis, Narcolepsy, Osteoporosis, Sudden infant death syndrome (SIDS),Tick paralysis (just-health.net., 2016).

1.4 The Major list of Non-communicable disease that is occurring globally

1.4.1 Diabetes mellitus

Diabetes, often referred to by doctors as diabetes mellitus, describes a group of metabolic diseases in which the person has high blood glucose (blood sugar), either because insulin production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria (frequent urination), they will become increasingly thirsty (polydipsia) and hungry (polyphagia).

1.4.1.1 Types of Diabetes mellitus

1) Type 1 diabetes

In type 1 diabetes, the pancreas is unable to produce any insulin, the hormone that controls blood sugar levels. Some people may refer to this type as insulin-dependent diabetes, juvenile diabetes, or early-onset diabetes. People usually develop type 1 diabetes before their 40th year, often in early adulthood or teenage years.

Type 1 diabetes is nowhere near as common as type 2 diabetes. Approximately 10% of all diabetes cases are type 1.

Patients with type 1 diabetes will need to take insulin injections for the rest of their life. They must also ensure proper blood-glucose levels by carrying out regular blood tests and following a special diet (MacGil, 2016).

Causes of type 1 diabetes

The gradual destruction of beta cells in the pancreas that eventually results in the onset of type 1 diabetes is the result of autoimmune destruction. The immune system turning against the body's own cells is possibly triggered by an environmental factor exposed to people who have a genetic susceptibility.

Risk factors of type 1 diabetes

- **Susceptibility genes** - some of which are carried by over 90% of patients with type 1 diabetes. Some populations - Scandinavians and Sardinians, for example - are more likely to have susceptibility genes
- **Autoantigens** - proteins thought to be released or exposed during normal pancreas beta cell turnover or injury such as that caused by infection. The autoantigens activate an immune response resulting in beta cell destruction
- **Viruses** - coxsackievirus, rubella virus, cytomegalovirus, Epstein-Barr virus and retroviruses are among those that have been linked to type 1 diabetes
- **Diet** - infant exposure to dairy products, high nitrates in drinking water and low vitamin D intake have also been linked to the development of type 1 diabetes (Kishore, 2016**).**

2) Type 2 diabetes

The body does not produce enough insulin for proper function, or the cells in the body do not react to insulin (insulin resistance). Approximately 90% of all cases of diabetes worldwide are type 2.

Some people may be able to control their type 2 diabetes symptoms by losing weight, following a healthy diet, doing plenty of exercise, and monitoring their blood glucose levels. However, type 2 diabetes is typically a progressive disease - it gradually gets worse - and the patient will probably end up have to take insulin, usually in tablet form (MacGil, 2016).

Causes of type 2 diabetes

At first, the pancreas makes more insulin to try to get glucose into the cells. But eventually it can't keep up, and the sugar builds up in your blood instead.

Usually a combination of things cause type 2 diabetes, including:

Genes. Scientists have found different bits of DNA that affect how body makes insulin.

Extra weight. Being overweight or obese can cause insulin resistance. Now type 2 diabetes affects kids and teens as well as adults, mainly because of childhood obesity.

Metabolic syndrome. People with insulin resistance often have a group of conditions including high blood glucose, extra fat around the waist, high blood pressure, and high cholesterol and triglycerides.

Too much glucose from liver. When blood sugar is low, liver makes and sends out glucose. After eat, blood sugar goes up, and usually the liver will slow down and store its glucose for later. But some people's livers don't. They keep cranking out sugar.

Bad communication between cells. Sometimes cells send the wrong signals or don't pick up messages correctly. When these problems affect how cells make and use insulin or glucose, a chain reaction can lead to diabetes.

Broken beta cells. If the cells that make the insulin send out the wrong amount of insulin at the wrong time, blood sugar gets thrown off. High blood glucose can damage these cells, too (Dansinger, 2015).

Risk factors for type 2 diabetes

Four of the main risk factors for developing type 2 diabetes are:

- **age** – being over the age of 40 (over 25 for south Asian people)
- **genetics** – having a close relative with the condition (parent, brother or sister)
- **weight** – being overweight or obese
- **ethnicity** – being of south Asian, Chinese, African-Caribbean or black African origin Causes of type 2 diabetes (NHS Choices, 2014).

3) Gestational diabetes

This type affects females during pregnancy. Some women have very high levels of glucose in their blood, and their bodies are unable to produce enough insulin to transport all of the glucose into their cells, resulting in progressively rising levels of glucose. Diagnosis of gestational diabetes is made during pregnancy.

The majority of gestational diabetes patients can control their diabetes with exercise and diet. Between 10%to20% of them will need to take some kind of blood-glucose-controlling medications. Undiagnosed or uncontrolled gestational diabetes can raise the risk of complications during childbirth. The baby may be bigger than he/she should be.

Prediabetes

The vast majority of patients with type 2 diabetes initially had prediabetes. Their blood glucose levels where higher than normal, but not high enough to merit a diabetes diagnosis. The cells in the body are becoming resistant to insulin.

Studies have indicated that even at the prediabetes stage, some damage to the circulatory system and the heart may already have occurred (MacGil, 2016).

1.4.1.2 Common symptoms of diabetes

The most common signs and symptoms of diabetes are:

Frequent urination-Excessive thirst and frequent urination are classic symptoms of diabetes. When there is too much glucose (sugar) in blood will urinate more often.

Disproportionate thirst-If urination more than usual, need to replace that lost liquid and drink more than usual.

Intense hunger-As the insulin in blood is not working properly, or is not there at all, and cells are not getting their energy, body may react by trying to find more energy - food. Intense hunger may occur**.**

Weight gain-This might be the result of the above symptom (intense hunger).

Unusual weight loss-This is more common among people with Diabetes Type 1. As body is not making insulin it will seek out another energy source (the cells aren't getting glucose). Muscle tissue and fat will be broken down for energy. As Type 1 is of a more sudden onset and Type 2 is much more gradual, weight loss is more noticeable with Type 1.

Increased fatigue-If insulin is not working properly, or is not there at all, glucose will not be entering cells and providing them with energy. This will make feel tired and listless. Irritability-Irritability can be due to your lack of energy.

Blurred vision-This can be caused by tissue being pulled from eye lenses. This affects eyes' ability to focus. With proper treatment this can be treated. There are severe cases where blindness or prolonged vision problems can occur (MacGil, 2016).

Cuts and bruises don't heal properly or quickly-If anyone find cuts and bruises take a much longer time than usual to heal there is more sugar (glucose) in his/her body. This is a symptom of diabetes.

More skin and/or yeast infections-When there is more sugar in your body, its ability to recover from infections is affected. Women with diabetes find it especially difficult to recover from bladder and vaginal infections.

Itchy skin-A feeling of itchiness on skin is sometimes a symptom of diabetes**.**

Gums are red and/or swollen - Gums pull away from teeth-If gums are tender, red and/or swollen this could be a sign of diabetes. Teeth could become loose as the gums pull away from them.

Sexual dysfunction among men-If age over 50 and experience frequent or constant sexual dysfunction (erectile dysfunction), it could be a symptom of diabetes (MacGil, 2016).
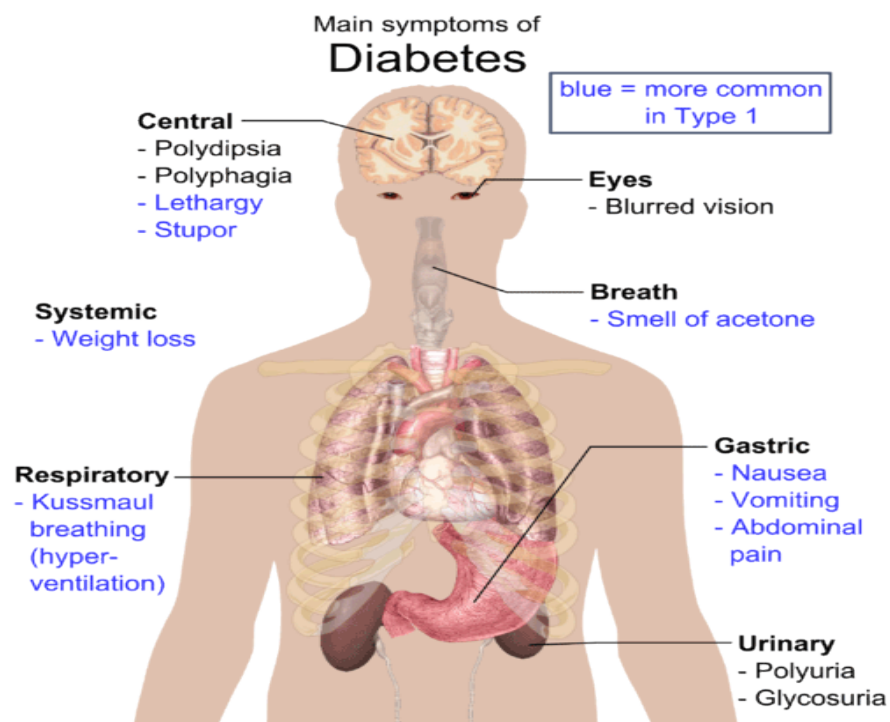
Figure 1.1: Main symptoms of diabetes mellitus

1.4.1.3 Diagnosis of Diabetes

Blood tests for diabetes diagnosis

One of three blood tests can be used to confirm a diagnosis of diabetes:

- Fasting plasma glucose (FPG) levels - a blood test after 8 hours of no eating

- Glycosylated hemoglobin (HbA1c) - to measure a marker of the average blood glucose level over the past 2-3 months
- Oral glucose tolerance testing (OGTT) - a test used less frequently that measures levels before and 2 hours after consuming a sweet drink (concentrated glucose solution) (American Diabetes Association, 2014).

Doctors can determine whether a patient has a normal metabolism, prediabetes or diabetes in one of three different way. There are three possible tests:

- **The A1C test**
  - at least 6.5% means diabetes
  - between 5.7% and 5.99% means prediabetes
  - less than 5.7% means normal
- **The FPG (fasting plasma glucose) test**

  - at least 126 mg/dl means diabetes
  - between 100 mg/dl and 125.99 mg/dl means prediabetes
  - less than 100 mg/dl means normal

  An abnormal reading following the FPG means the patient has impaired fasting glucose (IFG)

- **The OGTT (oral glucose tolerance test)**
  - at least 200 mg/dl means diabetes
  - between 140 and 199.9 mg/dl means prediabetes
  - less than 140 mg/dl means normal

  An abnormal reading following the OGTT means the patient has impaired glucose tolerance (IGT) (MacGil, 2016).

Urine tests for diabetes diagnosis

Urine tests are no longer used to make a diagnosis of diabetes. A urine sample may be used, however, to test for ketones, particularly in people with type 1 diabetes who exhibit certain symptoms. Here, the test can pick up ketoacidosis, a complication of diabetes

1.4.1.4 Treatment and management

Type 1 diabetes

Type 1 diabetes always requires insulin treatment and an insulin pump or daily injections will be a lifelong requirement to keep blood sugar levels under control. The condition used to be known as insulin-dependent diabetes.

After the diagnosis of type 1 diabetes, health care providers will help patients learn how to self-monitor via finger stick testing, the signs of hypoglycemia, hyperglycemia and other diabetic complications. Most patients will also be taught how to adjust their insulin doses.

As with other forms of diabetes, nutrition and physical activity and exercise are important elements of the lifestyle management of the disease (Kishore, 2016).

Type 2 diabetes

Type 2 diabetes has a number of drug treatment options to be taken by mouth known as oral antihyperglycemic drugs or oral hypoglycemic drugs.

Oral diabetes drugs are usually reserved for use only after lifestyle measures have been unsuccessful in lowering glucose levels to the target of an HbA1c below 7.0%, achieved through an average glucose reading of around 8.3-8.9 mmol/L (around 150-160 mg/dL).

The lifestyle measures that are critical to type 2 diabetes management are diet and exercise, and these remain an important part of treatment when pills are added. To keep control of glucose levels additionally, keeping control of blood pressure and lipid levels helps to prevent complications of diabetes (Kishore, 2016).

People with type 1 diabetes cannot use oral pills for treatment, and must instead take insulin.

Oral drugs are available for type 2 diabetes

Metformin

Sulphonylureas: There are several drug names in this class, including: Chlorpropamide,Glimepiride,Glipizide, Glyburide.

Glitazones: Two glitazones are availablePioglitazone and Rosiglitazone.

Alpha-glucosidase inhibitors

Dipeptidyl peptidase-4 (DPP4) inhibitors include alogliptin, linagliptin, saxagliptin and sitagliptin.

Sodium-glucose co-transporter 2 (SGLT2) inhibitors include canagliflozin and dapagliflozin.

Meglitinides(NHS Choices, 2014).

1.4.1.5 Complications:

List of possible complications:

- **Eye complications** - glaucoma, cataracts, diabetic retinopathy, and some others.
- **Foot complications** - neuropathy, ulcers, and sometimes gangrene which may require that the foot be amputated
- **Skin complications** - people with diabetes are more susceptible to skin infections and skin disorders
- **Heart problems** - such as ischemic heart disease, when the blood supply to the heart muscle is diminished
- **Hypertension** - common in people with diabetes, which can raise the risk of kidney disease, eye problems, heart attack and stroke
- **Mental health** - uncontrolled diabetes raises the risk of suffering from depression, anxiety and some other mental disorders
- **Hearing loss** - diabetes patients have a higher risk of developing hearing problems

- **Gum disease** - there is a much higher prevalence of gum disease among diabetes patients
- **Gastroparesis** - the muscles of the stomach stop working properly
- **Ketoacidosis** - a combination of ketosis and acidosis; accumulation of ketone bodies and acidity in the blood.
- **Neuropathy** - diabetic neuropathy is a type of nerve damage which can lead to several different problems.
- **HHNS (Hyperosmolar Hyperglycemic Nonketotic Syndrome)** - blood glucose levels shoot up too high, and there are no ketones present in the blood or urine. It is an emergency condition.
- **Nephropathy** - uncontrolled blood pressure can lead to kidney disease
- **PAD (peripheral arterial disease)** - symptoms may include pain in the leg, tingling and sometimes problems walking properly
- **Stroke** - if blood pressure, cholesterol levels, and blood glucose levels are not controlled, the risk of stroke increases significantly
- **Erectile dysfunction** - male impotence.
- **Infections** - people with badly controlled diabetes are much more susceptible to infections

- **Healing of wounds** - cuts and lesions take much longer to heal (MacGil, 2016).

1.4.2 Hypertension

High blood pressure is a common condition in which the long-term force of the blood against artery walls is high enough that it may eventually cause health problems, such as heart disease, kidney disease, stroke or dementia.

Blood pressure is determined both by the amount of blood heart pumps and the amount of resistance to blood flow in arteries. The more blood heart pumps and the narrower arteries, the higher blood pressure (Mayo clinic, 2015).

Over 5 million people in England are unaware they have high blood pressure, yet it affects more than 1 in 4 adults.

1.4.2.1 Symptoms of high blood pressure

High blood pressure (hypertension) usually has no obvious symptoms and many people have it without knowing.

Untreated high blood pressure can lead to serious diseases, including stroke, heart disease and kidney failure.

In some rare cases, where a person has very high blood pressure, they can experience symptoms, including:

- a persistent headache
- blurred or double vision
- nosebleeds
- shortness of breath (NHS Choices, 2014).

1.4.2.2 Causes of high blood pressure

Primary (essential) hypertension

For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

Secondary hypertension

About 10% of high blood pressure cases are the result of an underlying condition or cause. These cases are referred to as secondary hypertension.

Common causes of secondary hypertension include:

- kidney disease
- diabetes
- narrowing of the arteries (large blood vessels) supplying the kidneys
- hormonal conditions, such as Cushing's syndrome
- conditions that affect the body's tissue, such as lupus
- oral contraceptive pill

- painkillers known as nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen
- recreational drugs, such as cocaine, amphetamines and crystal methamphetamine herbal remedies, such as herbal supplements (Mayo clinic, 2015).

1.4.2.3 Risk factors

High blood pressure has many risk factors, including:

- **Age.** The risk of high blood pressure increases as you age. Through early middle age, or about age 45, high blood pressure is more common in men. Women are more likely to develop high blood pressure after age 65.
- **Race.** High blood pressure is particularly common among blacks, often developing at an earlier age than it does in whites. Serious complications, such as stroke, heart attack and kidney failure, also are more common in blacks.
- **Family history.** High blood pressure tends to run in families.
- **Being overweight or obese.** The more you weigh the more blood you need to supply oxygen and nutrients to your tissues. As the volume of blood circulated through your blood vessels increases, so does the pressure on your artery walls.
- **Not being physically active.** People who are inactive tend to have higher heart rates. The higher your heart rate, the harder your heart must work with each contraction and the stronger the force on your arteries. Lack of physical activity also increases the risk of being overweight.
- **Using tobacco.** Not only does smoking or chewing tobacco immediately raise your blood pressure temporarily, but the chemicals in tobacco can damage the lining of your artery walls. This can cause your arteries to narrow, increasing your blood pressure. Secondhand smoke also can increase your blood pressure.
- **Too much salt (sodium) in your diet.** Too much sodium in your diet can cause your body to retain fluid, which increases blood pressure.
- **Too little potassium in your diet.** Potassium helps balance the amount of sodium in your cells. If you don't get enough potassium in your diet or retain enough potassium, you may accumulate too much sodium in your blood.
- **Too little vitamin D in your diet.** It's uncertain if having too little vitamin D in your diet can lead to high blood pressure. Vitamin D may affect an enzyme produced by your kidneys that affects your blood pressure.

- **Drinking too much alcohol.** Over time, heavy drinking can damage your heart. Having more than two drinks a day for men and more than one drink a day for women may affect your blood pressure.

  If drink alcohol, do so in moderation. For healthy adults, that means up to one drink a day for women of all ages and men older than age 65, and up to two drinks a day for men age 65 and younger. One drink equals 12 ounces of beer, 5 ounces of wine or 1.5 ounces of 80-proof liquor.

- **Stress.** High levels of stress can lead to a temporary increase in blood pressure. If you try to relax by eating more, using tobacco or drinking alcohol, you may only increase problems with high blood pressure.

- **Certain chronic conditions.** Certain chronic conditions also may increase your risk of high blood pressure, such as kidney disease, diabetes and sleep apnea.

Sometimes pregnancy contributes to high blood pressure, as well.

Although high blood pressure is most common in adults, children may be at risk, too. For some children, high blood pressure is caused by problems with the kidneys or heart. But for a growing number of kids, poor lifestyle habits, such as an unhealthy diet, obesity and lack of exercise, contribute to high blood pressure (Mayo clinic, 2015).

1.4.2.4Tests and diagnosis

To measure blood pressure, doctor or a specialist will usually place an inflatable arm cuff around arm and measure blood pressure using a pressure-measuring gauge.

A blood pressure reading, given in millimeters of mercury (mm Hg), has two numbers. The first, or upper, number measures the pressure in arteries when heart beats (systolic pressure). The second, or lower, number measures the pressure in arteries between beats (diastolic pressure).

Blood pressure measurements fall into four general categories:

- **Normal blood pressure.** Blood pressure is normal if it's below 120/80 mm Hg.

- **Prehypertension.** Prehypertension is a systolic pressure ranging from 120 to 139 mm Hg or a diastolic pressure ranging from 80 to 89 mm Hg. Prehypertension tends to get worse over time.
- **Stage 1 hypertension.** Stage 1 hypertension is a systolic pressure ranging from 140 to 159 mm Hg or a diastolic pressure ranging from 90 to 99 mm Hg.
- **Stage 2 hypertension.** More severe hypertension, stage 2 hypertension is a systolic pressure of 160 mm Hg or higher or a diastolic pressure of 100 mm Hg or higher.

Both numbers in a blood pressure reading are important. But after age 60, the systolic reading is even more significant. Isolated systolic hypertension is a condition in which the diastolic pressure is normal (less than 90 mm Hg) but systolic pressure is high (greater than 140 mm Hg). This is a common type of high blood pressure among people older than 60 (Mayo clinic, 2015).

1.4.2.5 Treatment and management

. Doctor may recommend several lifestyle changes, including:

- Eating a healthier diet with less salt (the Dietary Approaches to Stop Hypertension, or DASH, diet)
- Exercising regularly
- Quitting smoking
- Limiting the amount of alcohol
- Maintaining a healthy weight
- Manage stress
- Monitor your blood pressure at home

Medications to treat high blood pressure

- **Thiazide diuretics.**Diuretics, sometimes called water pills, are medications that act on kidneys to help body eliminate sodium and water, reducing blood volume (Mayo clinic, 2015).

Thiazide diuretics are often the first, but not the only, choice in high blood pressure medications. Thiazide diuretics include hydrochlorothiazide (Microzide), chlorthalidone and others.

- **Angiotensin-converting enzyme (ACE) inhibitors.** These medications such as lisinopril (Zestril), benazepril (Lotensin), captopril (Capoten) and others help relax blood vessels by blocking the formation of a natural chemical that narrows blood vessels. People with chronic kidney disease may benefit from having an ACE inhibitor as one of their medications.

- **Angiotensin II receptor blockers (ARBs).** These medications help relax blood vessels by blocking the action, not the formation, of a natural chemical that narrows blood vessels. ARBs include candesartan (Atacand), losartan (Cozaar) and others. People with chronic kidney disease may benefit from having an ARB as one of their medications.

- **Beta blockers.** These medications reduce the workload on heart and open blood vessels, causing heart to beat slower and with less force. Beta blockers include acebutolol (Sectral), atenolol (Tenormin) and others. When prescribed alone, beta blockers don't work as well, especially in older adults, but may be effective when combined with other blood pressure medications.

- **Calcium channel blockers.** These medications including amlodipine (Norvasc), diltiazem (Cardizem, Tiazac, others) and others help relax the muscles of your blood vessels. Some slow your heart rate. Calcium channel blockers may work better for older people and blacks than do ACE inhibitors alone.

- **Renin inhibitors.** Aliskiren (Tekturna) slows down the production of renin, an enzyme produced by kidneys that starts a chain of chemical steps that increases blood pressure.

Tekturna works by reducing the ability of renin to begin this process. Due to a risk of serious complications, including stroke, you shouldn't take aliskiren with ACE inhibitors or ARBs (Mayo clinic, 2015).

Additional medications

If anyone having trouble reaching blood pressure goal with combinations of the above medications, doctor may prescribe:

- **Alpha blockers.** These medications reduce nerve impulses to blood vessels, reducing the effects of natural chemicals that narrow blood vessels. Alpha blockers include doxazosin (Cardura), prazosin (Minipress) and others.
- **Alpha-beta blockers.** In addition to reducing nerve impulses to blood vessels, alpha-beta blockers slow the heartbeat to reduce the amount of blood that must be pumped through the vessels. Alpha-beta blockers include carvedilol (Coreg) and labetalol (Trandate).
- **Central-acting agents.** These medications prevent your brain from signaling your nervous system to increase heart rate and narrow blood vessels. Examples include clonidine (Catapres, Kapvay), guanfacine (Intuniv, Tenex) and methyldopa.
- **Vasodilators.** These medications, including hydralazine and minoxidil, work directly on the muscles in the walls of arteries, preventing the muscles from tightening and arteries from narrowing.
- **Aldosterone antagonists.** Examples are spironolactone (Aldactone) and eplerenone (Inspra). These drugs block the effect of a natural chemical that can lead to salt and fluid retention, which can contribute to high blood pressure.

To reduce the number of daily medication doses need, doctor may prescribe a combination of low-dose medications rather than larger doses of one single drug. In fact, two or more blood pressure drugs often are more effective than one. Sometimes finding the most effective medication or combination of drugs is a matter of trial and error (Mayo clinic, 2015).

1.4.2.6 Complications

The excessive pressure on your artery walls caused by high blood pressure can damage your blood vessels, as well as organs in your body. The higher your blood pressure and the longer it goes uncontrolled, the greater the damage.

Uncontrolled high blood pressure can lead to:

- **Heart attack or stroke.** High blood pressure can cause hardening and thickening of the arteries (atherosclerosis), which can lead to a heart attack, stroke or other complications.
- **Aneurysm.** Increased blood pressure can cause your blood vessels to weaken and bulge, forming an aneurysm. If an aneurysm ruptures, it can be life-threatening.
- **Heart failure.** To pump blood against the higher pressure in your vessels, your heart muscle thickens. Eventually, the thickened muscle may have a hard time pumping enough blood to meet your body's needs, which can lead to heart failure.
- **Weakened and narrowed blood vessels in your kidneys.** This can prevent these organs from functioning normally.
- **Thickened, narrowed or torn blood vessels in the eyes.** This can result in vision loss.
- **Metabolic syndrome.** This syndrome is a cluster of disorders of your body's metabolism, including increased waist circumference; high triglycerides; low high-density lipoprotein (HDL) cholesterol, the "good" cholesterol; high blood pressure; and high insulin levels. These conditions make you more likely to develop diabetes, heart disease and stroke.
- **Trouble with memory or understanding.** Uncontrolled high blood pressure may also affect your ability to think, remember and learn. Trouble with memory or understanding concepts is more common in people with high blood pressure (Mayo clinic, 2015).

1.5.3 Hyperlipidemia

Hyperlipidemia is an elevation of one or more fat proteins in the blood. It is commonly referred to as high cholesterol. One-third of American adults have it, only 1 in 3 have it under

control, and having hyperlipidemia doubles the risk of developing heart disease. Hyperlipidemia is also called high cholesterol, hypercholesterolemia, or hypertriglyceridemia.

Genetic predisposition, cigarette smoking, obesity, poor diet, and a sedentary lifestyle can all lead to hyperlipidemia. Although hyperlipidemia has no symptoms, it can be detected by a simple blood test.

Cholesterol is carried through the blood to cells by lipoproteins that are either

1. Low density (LDL)
   LDL is bad, as it will build up excess cholesterol in the blood.
2. High density (HDL).
   HDL is the good lipoprotein because it carries extra cholesterol back to the liver where it can be eliminated.

Think of the lipoprotein as the vehicle and cholesterol as the passenger. Triglycerides, a type of fat in the blood, are different from cholesterol, but because of their strong association with heart disease, triglycerides are measured as well. Often it is both the LDL and triglycerides that are elevated in hyperlipidemia (Davis, 2015).

Signs and symptoms of hyperlipidemia

With familial hyperlipidemia, a person could show signs of high cholesterol with yellowish fatty growths (xanthomas) around the eyes or the joints. Otherwise, hyperlipidemia has no signs or symptoms, and unless picked up with the fasting lipid profile, the high cholesterol would remain undetected.

Causes

The causes of hyperlipidemia are either genetic (familial or primary hyperlipidemia) or from a poor diet and other specific factors (secondary hyperlipidemia).

When the body cannot utilize or remove the excess fat, it accumulates in the blood. Over time, the buildup damages the arteries and internal organs. This process contributes to the development of heart disease.

In familial hyperlipidemia, the high cholesterol has nothing to do with poor habits but is caused by a genetic disorder. A mutated gene passed down from either the mother or father causes a missing or malfunctioning LDL receptor. The LDL accumulates to dangerous amounts in the blood.

Certain ethnic groups such as French Canadians, Christian Lebanese, South African Afrikaners, and Ashkenazi Jews are at a higher risk of hereditary hyperlipidemia.

Other causes of hyperlipidemia may include

1. excessive drinking of alcohol
2. obesity
3. side effects of medications such as hormones or steroids
4. diabetes
5. kidney disease
6. underactive thyroid gland,
7. Pregnancy,
8. cigarette smoking,
9. poor diet,
10. sedentary lifestyle

Tests and diagnosis of hyperlipidemia

Screening for hyperlipidemia is done with a blood test called a lipid profile. It is important that a person has nothing to eat or drink for 9-12 hours prior to having the sample drawn.

Screening should start at age 20, and if normal, it should be repeated at least every five years. Normal levels for a lipid profile are listed below:

- Total cholesterol: less than 200(in mg/dl)
- LDL: less than 100(in mg/dl)
- HDL: greater than 40mg/dl for men, greater than 50mg/dl for women (higher is even better)
- Triglycerides: less than 140(in mg/dl) (Davis, 2015).

Treatment and management of hyperlipidemia

Lifestyle modification remains the best strategy for both preventing and treating hyperlipidemia. This involves adhering to a "heart healthy" diet, regular exercise habits, no smoking, and maintenance of a healthy weight.

Diet suggestions

It is not necessary to follow a low-fat diet but rather reduce the intake of saturated fat, trans fats, and cholesterol.The diet should consist of a colorful array of whole fruits and vegetables, be high in fiber, and whole grains. Fast foods, high carbohydrate foods, and any foods that do not offer good nutritional value should be restricted or eliminated. Regular servings of fish, nuts, and legumes are recommended. When oil is used, it should be olive or another monounsaturated oil.

Weight

Being overweight is a risk factor for hyperlipidemia and heart disease. Losing weight can help lower your LDL, total cholesterol, and lower your triglyceride levels. It can also raise your HDL, which helps to remove the bad cholesterol out of the blood.

Physical activity

Not being physically active is a risk factor for heart disease. Regular exercise and activity can help lower LDL (bad) cholesterol and raise HDL (good) cholesterol levels. It also helps you lose weight. You should try to be physically active for 30 minutes at least 5 days a week. Brisk walking is an excellent and easy choice for exercise.

No smoking

Smoking activates many problems that contribute to heart disease. It promotes plaque buildup on the walls of the arteries, increases the bad cholesterol, encourages blood clot formations and inflammation.

Quitting smoking will result in increases in HDL, which may be part of the reduced cardiovascular disease risk seen after smoking cessation (Davis, 2015).

Medications

The most commonly prescribed high cholesterol medicines are statins (simvastatin, lovastatin, atorvastatin, and rosuvastatin).Occasionally statins are not tolerated due to side effects of muscle pain.

An advisory committee for the Food and Drug Administration has recommended the approval of a novel, injectable cholesterol-lowering drug called alirocumab, though many committee members have noted certain restrictions for its use and have requested further data on the drug's ability to reduce the risk of heart problems (Davis, 2015).

1.6 Other non-communicable disease conditions are given below

1. Osteoporosis

Osteoporosis, also known as porous bone, is a non-communicable disease resulting from low bone mass. Brittle bones weaken and break from a minor fall or movement. The National Osteoporosis Foundation states that of the 10 million Americans with osteoporosis, 80 percent are women. High risk factors for osteoporosis include low sex hormone levels, inactivity, smoking and diseases such as rheumatoid arthritis.

2. Alzheimer's

This condition causes dementia in those in advanced age, or over 60 years old. Symptoms of this condition can vary but often include getting lost, memory loss, difficulty managing daily tasks or managing money, personality changes, loss of bodily control or delusions.

3. Heart Disease

Heart disease is a broad category of non-communicable diseases that affect the way the heart and circulatory system performs. Heart disease includes rhythm irregularities, heart attack, congenital heart disease, heart failure, mitral valve prolapse, unstable angina, mitral stenosis, endocarditis, aortic regurgitation and cardiogenic shock.

4. Fibromyalgia

Fibromyalgia is a non-communicable disease involving the soft tissues of the body. Common symptoms include widespread pain, sleep disturbance patterns, irregular heartbeat and extreme exhaustion. Symptoms that intensify at times include memory and concentration difficulty, jaw pain, headaches, nasal congestion and irritable bowel syndrome.

5. Lung Cancer

Lung cancer causes malignant cell growth in the lung tissue, often as a result of exposure to pollutants or the use of tobacco products. As many as 90 percent of lung cancer cases are caused by smoking with non-smokers having a very small risk of this disease.

6. Leukemia

Leukemia causes the body to produce abnormal blood cells that then release malignant cells into the bloodstream. Since the bloodstream carries these malignant cells throughout the body they can affect other tissues such as the nervous system, skin or liver. While this disease is often associated with children, most patients are actually men over 60.

7. Skin Cancer

Skin cancer is caused when ultraviolet rays damage the skin cells. This can appear anywhere on the body but is most common on the skin. Those that have low pigmentation in the skin such as redheads, blondes or those with blue eyes tend to be at higher risk for this disease. Limiting direct skin exposure can significantly reduce the risk of developing skin cancer and with early detection this disease is 95 percent curable.

8. Seizures or Epilepsy

Seizures are caused by a neurologic malfunction that causes abnormal electrical activity within the brain. These can be localized or cause symptoms such as numbness that stems from an explosive firing of nerves in the brain. Tumors or brain damage can cause someone to develop this disease. There is no cure for epilepsy but medications can help to reduce the frequency of seizures (just-health.net., 2016).

1.7 Risk factors of non-communicable disease

All age groups and all regions are affected by NCDs. NCDs are often associated with older age groups, but evidence shows that 16 million of all deaths attributed to non-communicable diseases (NCDs) occur before the age of 70. Of these "premature" deaths, 82% occurred in low- and middle-income countries. There are two types of risk factors:

Modifiable behavioral risk factors

- **Tobacco use** -Tobacco accounts for around 6 million deaths every year (including from the effects of exposure to second-hand smoke), and is projected to increase to 8 million by 2030.
- **Physical inactivity**- About 3.2 million deaths annually can be attributed to insufficient physical activity.
- **Unhealthy diet** -More than half of the 3.3 million annual deaths from harmful drinking are from NCDs .
- **Use of alcohol** -In 2010, 1.7 million annual deaths from cardiovascular causes have been attributed to excess salt/sodium intake.

Metabolic/physiological risk factors

These behaviors lead to four key metabolic/physiological changes that increase the risk of NCDs: raised blood pressure, overweight/obesity, hyperglycemia (high blood glucose levels) and hyperlipidemia (high levels of fat in the blood).

In terms of attributable deaths, the leading metabolic risk factor globally is elevated blood pressure (to which 18% of global deaths are attributed) (1) followed by overweight and obesity and raised blood glucose. Low- and middle-income countries are witnessing the fastest rise in overweight young children (WHO, 2015).

1.8 Socioeconomic impacts of NCDs

NCDs threaten progress towards the UN Millennium Development Goals and post-2015 development agenda. Poverty is closely linked with NCDs. The rapid rise in NCDs is predicted to impede poverty reduction initiatives in low-income countries, particularly by increasing household costs associated with health care. Vulnerable and socially

disadvantaged people get sicker and die sooner than people of higher social positions, especially because they are at greater risk of being exposed to harmful products, such as tobacco or unhealthy food, and have limited access to health services.

In low-resource settings, health-care costs for cardiovascular diseases, cancers, diabetes or chronic lung diseases can quickly drain household resources, driving families into poverty. The exorbitant costs of NCDs, including often lengthy and expensive treatment and loss of breadwinners, are forcing millions of people into poverty annually, stifling development.

In many countries, harmful drinking and unhealthy diet and lifestyles occur both in higher and lower income groups. However, high-income groups can access services and products that protect them from the greatest risks while lower-income groups can often not afford such products and services (WHO, 2015).

1.9 Prevention and control of NCDs

To lessen the impact of NCDs on individuals and society, a comprehensive approach is needed that requires all sectors, including health, finance, foreign affairs, education, agriculture, planning and others, to work together to reduce the risks associated with NCDs, as well as promote the interventions to prevent and control them.

An important way to reduce NCDs is to focus on lessening the risk factors associated with these diseases. Low-cost solutions exist to reduce the common modifiable risk factors (mainly tobacco use, unhealthy diet and physical inactivity, and the harmful use of alcohol) and map the epidemic of NCDs and their risk factors.

Lower-income countries generally have lower capacity for the prevention and control of non-communicable diseases (WHO, 2015).

Use the following as a guideline:

A woman over 50 who is:

- Not physically active needs about 1600 calories a day
- Somewhat physically active needs about 1800 calories a day

- Very active needs about 2000 calories a day

A man over 50 who is:

- Not physically active needs about 2000 calories a day
- Somewhat physically active needs about 2200-2400 calories a day
- Very active needs about 2400-2800 calories a day (Erickson, 2014).

Food body needs as age

Fruit – Focus on whole fruits rather than juices for more fiber and vitamins and aim for at least 2 to 3 servings each day. Break the apple and banana rut and go for color-rich pickings like berries or melons.

Vegetable– Choose antioxidant-rich dark, leafy greens, such as kale, spinach, and broccoli as well as orange and yellow vegetables, such as carrots, squash, and yams. Try for 2 to 3 cups or more of vegetable every day.

Calcium – Maintaining bone health as you age depends on adequate calcium intake to prevent osteoporosis and bone fractures. Older adults need 1,200 mg of calcium a day through servings of milk, yogurt, or cheese. Non-dairy sources include tofu, broccoli, almonds, and kale.

Grains – Be smart with your carbs and choose whole grains over processed white flour for more nutrients and more fiber. If you're not sure, look for pasta, breads, and cereals that list "whole" in the ingredient list. Older adults need 6-7 ounces of grains each day (one ounce is about 1 slice of whole grain bread).

Protein – Adults over 50 without kidney disease or diabetes need about 1 to 1.5 grams per kilogram (2.2lbs) of bodyweight. This translates to 68 to 102g of high-quality protein per day for a person weighing 150 lbs. (0.5 g of protein per lb. of body weight is close enough). Try to divide protein intake equally among meals. It's important to vary sources of protein instead of relying on just red meat, including more fish, beans, peas, eggs, nuts, seeds, milk and cheese in diet (Robinson & Segal, 2016).

Salt intake

- 1500 mg of sodium amounts to 0.75 teaspoons or 3.75 grams of salt per day, while 2300 mg amounts to one teaspoon or 6 grams of salt per day.
- Most people today are eating much more than that. The average intake of sodium is about 3400 mg, most of it coming from processed foods (Gunnars, 2016).

Physical activity

To improve cardio respiratory and muscular fitness, bone health, reduce the risk of NCDs and depression:

- Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
- Aerobic activity should be performed in bouts of at least 10 minutes duration.
- For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity (WHO, 2016).

No smoking

Reducing tobacco use must be a key component of any national or global plan to tackle non-communicable diseases. Tobacco use is a shared risk factor for the leading non-communicable diseases in the world, causing 6 million deaths. So, quite smoking is very beneficial for control of NCDs (WHO, 2015).

Chapter 2
Literature Review

2 Literature Review

2.1 Non-communicable chronic disease in Bangladesh: Overview of existing programs and priorities going forward

To identify existing chronic disease programs in Bangladesh, country experts were interviewed and literature searches were conducted in Pub Med and Ovid Medline (January 1970 to June 2009) for potentially relevant studies focused on tobacco-related illnesses, diabetes or cardiovascular disease. Programs not being implemented at the time of the study were excluded. Programs underway at the time of the study were included. Bangladesh has a total of 11 NCD programs at varying levels of development. Roughly half of the programs involved diabetes; three addressed the reduction of primary risk factors and about half provided infrastructure (e.g., hospitals or clinics) for NCD services or health professional training. The programs were roughly divided between the government and nongovernment organizations (NGOs). The Bangladeshi government and non-government organizations have taken several steps to implement appropriate NCD programs, but there are many areas where efforts could be enhanced or strengthened. Key among them is improved monitoring and evaluation of NCD programs and the development of nationally representative NCD surveillance data which includes prevalence and associated risk factors (Bleich *et al*, 2011).

2.2 Chronic Non-Communicable Diseases and the Healthcare System in Bangladesh: Current Status and Way Forward

The rapidly increasing burden of chronic Non-Communicable Diseases (NCDs) constitutes a major public health challenge undermining the social and economic development throughout much of the developing world. NCDs accounted for 63% or 36 million of the estimated 57 million deaths that occurred globally in 2008 (WHO 2011). Resource poor developing countries like Bangladesh are faced with the most intractable challenge in this regard. Based on an extensive review of secondary data, the paper assesses the current burden and the future trend of NCDs in Bangladesh and at the same time examines the preparedness of the health system in responding to the challenges of chronic non-communicable diseases. The paper strongly argues that the NCDs pose an alarming issue for Bangladesh. However the health care system in Bangladesh needs to be further strengthened to effectively respond to this challenge. Bangladesh lacks a clearly

articulated national NCD plan. Moreover, currently there is no routine surveillance of NCD related morbidity and mortality or of NCD risk factors. The health system seems to have limited human, technical and functional capacity to promote behavioral changes conducive to prevent NCDs. At the primary health care level, Bangladesh initiated limited number of poorly defined NCD-related health promotion activities. Clearly the health system

in Bangladesh demands greater financial, human and technical resources to effectively address NCDs (Islam & Biswas, 2014).

2.3 SP1-50 Current status update on non-communicable diseases in Bangladesh

There is increasing evidence to suggest that the epidemiologic transition is well underway in Bangladesh and many of the low and middle income countries are facing a dual burden, with a huge load of infectious diseases and an increasing burden due to NCDs. In Bangladesh around 12.5% of all deaths are caused due to various types of cardiovascular diseases among 27.6% death due to NCDs. The prevalence of hypertension is reported as around 12% and the prevalence of diabetes in urban area is double (10%) than rural area (5%). The prevalence of COPD (≥30 years) is 3% among general population and 6% for inpatients of medical college. Last 5 years government of Bangladesh has spent 950.07 lac BDT through HNPSP for NCD, in which arsenic program got more than 70% of the budget and WHO 5.53 lac USD for last 2 years to develop different policy, guideline and risk factor survey. As a developing country, in Bangladesh, addressing NCDs happens to be a multifaceted challenge. Appropriate strategies under high level political commitment and necessary funding as a part of the integrated development and health agenda of Bangladesh are essential (Talukder *et al*, 2011).

2.4 Care-seeking patterns for fatal non-communicable diseases among women of reproductive age in rural northwest Bangladesh

This analysis seeks to describe care-seeking behavior among women of reproductive age who died from fatal non-communicable diseases as recorded in northwest rural Bangladesh between 2001 and 2007.This analysis utilized data from a large population-based cohort trial in northwest rural Bangladesh. To conduct verbal autopsies of women who died while under study surveillance, physicians interviewed family members to elicit the biomedical symptoms that the women experienced as well as a narrative of the events leading to deaths. We performed qualitative textual analysis of verbal autopsy narratives

for 250 women of reproductive age who died from non-communicable diseases between 2001 and 2007. The majority of women (94%) sought at least one provider for their illnesses. Approximately 71% of women first visited non-certified providers such as village doctors and traditional healers, while 23% first sought care from medically certified providers. After the first point of care, women appeared to switch to medically certified practitioners when treatment from non-certified providers failed to resolve their illness. This study suggests that treatment seeking patterns for non-communicable diseases are affected by many of the sociocultural factors that influence care seeking for pregnancy-related illnesses. Families in northwest rural Bangladesh typically delayed seeking treatment from medically certified providers for NCDs due to the cost of services, distance to facilities, established relationships with non-certified providers, and lack of recognition of the severity of illnesses. Most women did not realize initially that they were suffering from a chronic illness. Since women typically reached medically certified providers in advanced stages of disease, they were usually told that treatment was not possible or were referred to higher-level facilities that they could not afford to visit. Women suffering from non-communicable disease in these rural communities need feasible and practical treatment options. Further research and investment in adequate, appropriate care seeking and referral is needed for women of reproductive age suffering from fatal non-communicable diseases in resource-poor settings (Sikder *et al*, 2012).

2.5 Non-Communicable Diseases in Bangladesh

An Overview *Globally* non-communicable diseases (NCDs) are attributable to 38 million deaths, three-fourth of which is caused in low- and middle-income countries. NCDs attribute to almost half of the disease burden of the adult population in South Asian countries. The increased attention had been paid on NCDs in low- and middle-income countries, the context-specificity of these NCDs are yet inadequately explored. Bangladesh, a South Asian country, and one of the most populous of the world is now dealing with an epidemiological transition from infectious diseases to the emergence of NCDs. The based on extensive literature review, article focuses on the case study of the impact of NCDs in Bangladesh. Epidemiology and impact of diseases were analyzed along with reported risk factors. Several efforts had been made in prevention and treatment of NCDs, which demonstrated both successes and challenges. The article also gives an overview of existing programs, recommends priorities going forward (Gourab, 2016).

2.6 Non-communicable diseases in sub-Saharan Africa: what we know now

The Pub Med database was for studies on each condition, and included those that were community based, conducted in any SSA country and reported on disease or risk factor prevalence, incidence or mortality. It was found that few community-based studies and some countries (such as South Africa) were over-represented. The prevalence of NCDs and risk factors varied considerably between countries, urban/rural location and other sub-populations. The prevalence of stroke ranged from 0.07 to 0.3%, diabetes mellitus from 0 to 16%, hypertension from 6 to 48%, obesity from 0.4 to 43% and current smoking from 0.4 to 71%. Hypertension prevalence was consistently similar among men and women, whereas women were more frequently obese and men were more frequently current smokers. The prevalence of NCDs and their risk factors is high in some SSA settings. With the lack of vital statistics systems, epidemiologic studies with a variety of designs (cross-sectional, longitudinal and interventional) capable of in-depth analyses of risk factors could provide a better understanding of NCDs in SSA, and inform health-care policy to mitigate the oncoming NCD epidemic (Dalal *et al*, 2011).

2.7 The double burden of communicable and non-communicable diseases in developing countries

Now, at the dawn of the third millennium, non-communicable diseases are sweeping the entire globe. There is an increasing trend in developing countries, where the demographic and socio-economic transition imposes more constraints on dealing with the double burden of infectious and non-infectious diseases in a poor environment, characterized by ill-health systems. It is predicted that, by 2020, non-communicable diseases will cause seven out of every ten deaths in developing countries. Among non-communicable diseases, special attention is devoted to cardiovascular disease, diabetes, cancer and chronic pulmonary disease. The burden of these conditions affects countries worldwide but with a growing trend in developing countries. Preventative strategies must take into account the growing trend of risk factors correlated to these diseases. In parallel, despite the success of vaccination programmes for polio and some childhood diseases, other diseases like AIDS, tuberculosis, malaria and dengue are still out of control in many regions of the globe. This paper is a brief review of recent literature dealing with communicable and non-communicable diseases in developing countries. It gives a global

view of the main diseases and their impact on populations living in low- and middle-income nations (Boutayed, 2005).

2.8 Clustering of non-communicable diseases risk factors in Bangladeshi adults: An analysis of STEPS survey 2013

Non-communicable diseases (NCDs) have already become major killers in Bangladesh. Once NCDs are developed, they become chronic health and economic problems. Their primary prevention is linked to their common risk factors. This study was conducted to determine the prevalence of NCD risk factors with a focus on their clustering in Bangladeshi adults. This nationally representative study was done in 4,073 (1,812 men and 2,261 women) adults aged 25 years or older selected from rural and urban households. Multistage cluster sampling design was used. Selected variables were in line with steps I and II of WHO stepwise surveillance except alcohol. Forty-four percent used tobacco in any form. Almost 93 % did not consume adequate fruit and vegetables (5 servings or more). Thirty eight percent had low physical activity level (<600 MET-minutes/week). One-quarter (26 %) were overweight (body mass index $>=25$ kg/m^2). Twenty-one percent had hypertension (blood pressure $>=140/90$ mmHg or medication) and about 5 % had documented diabetes. Upon examination of risk factor clustering, we observed that 38 % had at least three risk factors. After this threshold, clustering suddenly dropped down to a fairly low level. Using this threshold as a cut-off, clustering of risk factors was associated with age, male gender, urban residence, educational levels and quality of house in multivariate analysis. Prevalence of NCD risk factors is fairly high in Bangladeshi adults with a tendency of clustering. If a risk factor such as hypertension is detected, a closer look for other risk factors has to be given in both at clinical and public health settings. Clustering raises risk by more than a summation of risk factors. Our findings, therefore, suggest that Bangladesh could expect a significant increase in NCDs in near future (Zaman *et al,* 2015).

2.9 The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf States

This paper reviews studies on the prevalence of overweight, obesity and related nutrition-related non-communicable diseases in Bahrain, Kuwait, Qatar, Oman, Saudi Arabia and the UAE. Obesity is common among women; while men have an equal or higher

overweight prevalence. Among adults, overweight plus obesity rates are especially high in Kuwait, Qatar and Saudi Arabia, and especially among 30–60 year olds (70–85% among men; 75–88% among women), with lower levels among younger and elderly adults. The rate of increase in obesity was pronounced in Saudi Arabia and Kuwait. Prevalence of obesity is high among Kuwaiti and Saudi pre-schoolers (8–9%), while adolescent overweight and obesity are among the highest in the world, with Kuwait having the worst estimates (40–46%); however, comparison of child data is difficult because of differing standards. Among nutrition-related non-communicable diseases, hypertension and diabetes levels are very high and increase with age, with the UAE performing the worst because of a rapid rate of increase between 1995 and 2000. Additional monitoring of the prevalence of metabolic syndrome and cancers is necessary. Nationally representative longitudinal surveys with individual, household and community-level information are needed to determine the importance of various factors that contribute to these troubling trends (Zaghloul *et al,*2010).

2.10 Community-based non-communicable disease interventions: lessons from developed countries for developing ones

Community-based programmes for prevention and control of cardiovascular diseases (CVD) started in Europe and the USA in the early 1970s. High mortality from CVD in Finland led to the start of the North Karelia Project. Since then, a vast amount of scientific literature has accumulated to present results and discuss experience. The results indicate that heart health programmes have a high degree of generalizability, are cost-effective and can influence health policy. In the 1980s the focus of programmes expanded from CVD to non-communicable diseases (NCD), mainly because of the common risk factors. Attention has now turned to promoting this approach in developing countries, where the prevalence of NCD is growing. Theory and experience show that community-based NCD programmes should be planned, run and evaluated according to clear principles and rules, collaborate with all sectors of the community, and maintain close contact with the national authorities. In view of the burden of disease they represent and of globalization, there is a great need for international collaboration. Practical networks with common guidelines but adaptable to local cultures in a flexible way have proved to be very useful (Nissinen *et al*, 2001).

2.11 Risk factors for non-communicable chronic diseases in women in China: surveillance efforts

Data from the 2010 China Chronic Disease and Risk Factor Surveillance survey, comprising a nationally representative sample of women, were obtained to determine the prevalence of eight risk factors for chronic NCDs: current smoking, harmful use of alcohol, insufficient intake of fruit and vegetables, physical inactivity, overweight and obesity, raised blood pressure, raised fasting blood glucose and raised total serum cholesterol. The mean number of risk factors per woman was estimated. Their independent demographic and socioeconomic covariates were also examined with ordinal logistic regression. The following prevalences were found: insufficient intake of fruit and vegetables, 51.7%; overweight and obesity, 32.3%; raised blood pressure, 29.7%; physical inactivity, 18.3%; raised total serum cholesterol, 18.1%; raised blood glucose, 7.0%; current smoking, 2.4%; and harmful use of alcohol, 1.3%. The mean number of risk factors per woman was 1.61; 48.0% of the women had at least two risk factors. Women who were older, poorer, from rural areas or from eastern or central China had more risk factors, but only being more than 35 years old, poorly educated and a resident of eastern or central China independently increased the likelihood of having multiple risk factors. Risk factors for chronic NCDs are common among Chinese women aged 18 or older. Interventions to reduce these factors are needed and should target women who are older, who live in eastern or central China or who are poorly educated (Li *et al*, 2013).

Significance of the Study

Non-communicable diseases (NCDs) are disease processes that are not contagious or transferable from one human to another (Anderson, 2011). A new report published by the World Health Organization calculates that almost two-thirds of all worldwide deaths are now the result of non-communicable diseases. The report also points out that, contrary to popular opinion, nearly 80% of deaths from non-communicable disease occur in low- and middle-income countries. The report estimates that the worldwide number of deaths attributable to non-communicable disease will increase by 15% between 2010 and 2020, with the greatest increases in Africa and South-East Asia. Most of these deaths will be associated with tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol (WHO, 2011).

Tobacco accounts for around 6 million deaths every year and is projected to increase to 8 million by 2030. About 3.2 million deaths annually can be attributed to insufficient physical activity. More than half of the 3.3 million annual deaths from harmful drinking are from NCDs. In 2010, 1.7 million annual deaths from cardiovascular causes have been attributed to excess salt/sodium intake (WHO, 2015).

Most recent estimates from 2006 indicate that NCD's represent 68 percent of total mortality. In Bangladesh, it is projected that the number of people with diabetes in Bangladesh will increase from 1.5 million in 2000 to 4 million in 2025. A recent household survey in Bangladesh estimated that tobacco-related illnesses were responsible for 16 percent of all deaths in the country (Bleich, 2011).

We can see from recent literature review on non-communicable disease in Bangladesh NCDs accounted for 63% or 36 million of the estimated 57 million deaths that occurred globally in 2008 (WHO, 2011).

In Bangladesh around 12.5% of all deaths are caused due to various types of cardiovascular diseases among 27.6% death due to NCDs. The prevalence of hypertension is reported as around 12% and the prevalence of diabetes in urban area is double (10%) than rural area (5%) (Talukder, 2011).

The emerging pandemic of non-communicable diseases (NCDs) creates a new frontier for health professionals globally. Most of the forecasted increase in NCD prevalence and death rates can be accounted for by emerging NCD epidemics in developing countries. Bangladesh has been facing a dual burden of existing infectious diseases and escalating rise of NCDs like diabetes, heart disease, stroke, cancer, chronic respiratory disease, etc. For getting prepared for the challenge of these diseases, information regarding their distribution and determinants is indispensable. Their control could well be addressed through their common risk factors. Therefore it is of prime importance to conduct a survey on NCD risk factors taking into account of national representatives (WHO, 2010).

As the prevalence of risk factors is increasing in Bangladesh this study is designed to have an estimate of NCD and its risk factors among female respondents of ≥18 years following WHO STEPS with modification. The study will provide information about the distribution of the risk factors such as tobacco use, fruit and vegetables intake, physical activity, sitting or reclining time, unhealthy diet, obesity, hypertension, family history. It will also help have an idea about the knowledge and awareness of the population regarding NCDs and their behavior towards the advice given to them (if any) by the physicians for reducing risk factors.

Aims and Objective of the Study

The main objectives of the study are –
- ✓ To find out the prevalence of NCDs among female respondents.
- ✓ To determine the behavioral risk factors associated with non-communicable disease.
- ✓ To determine the biological risk factors associated with non-communicable disease.
- ✓ To determine the knowledge and awareness regarding the risk factors.

Chapter 3
Study method

3 Study method

3.1 Study area

Data were collected from different area of Dhaka city.

3.2 Total number of participants

Data were collected from 329 female person.

3.3 Inclusion criteria

- Only female.
- Age limit of female respondents ≥18 years old.

3.4 Exclusion criteria

- Unwilling to participate and unable to comply with protocol requirements.

3.5 Procedure

- For collecting data, a questionnaire was prepared according to required information.
- This survey was conducted by face to face interview of respondents and measure blood pressure.
- The collected data were analyzed with the help of Microsoft Office Excel and filtered out accordingly for analysis. Some graphical representations were made from those analysis statuses.

Chapter 4
Results

4 Results

4.1 Age distribution
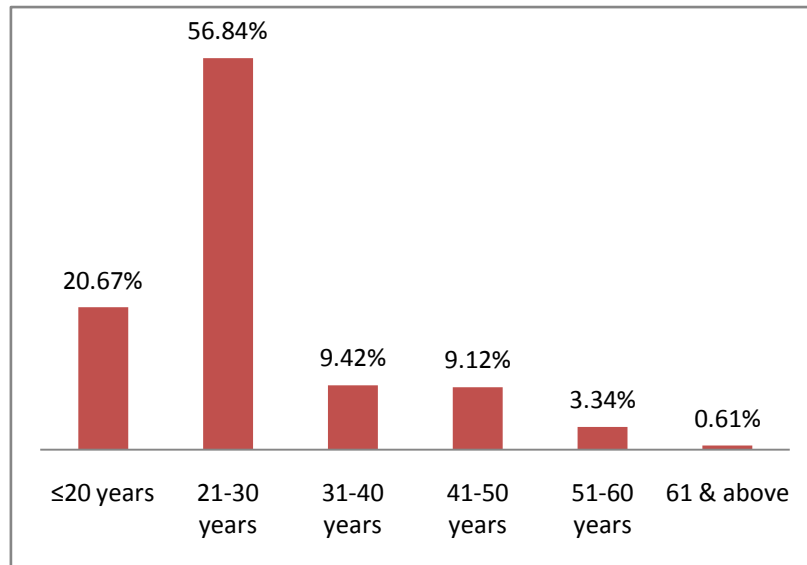
Fig 4.1: Age distribution

Among 329 female respondents, majority of them are in the age limit 21-30 years are of (56.84)%, then age ≤ 20 years are of 20.67%, then age (31-40) years are of 9.42%, then age (41-50) years are of 9.12%, then age (51-60) years are of 3.34% and rest of age 61& above years having 0.61%.

4.2 Education level
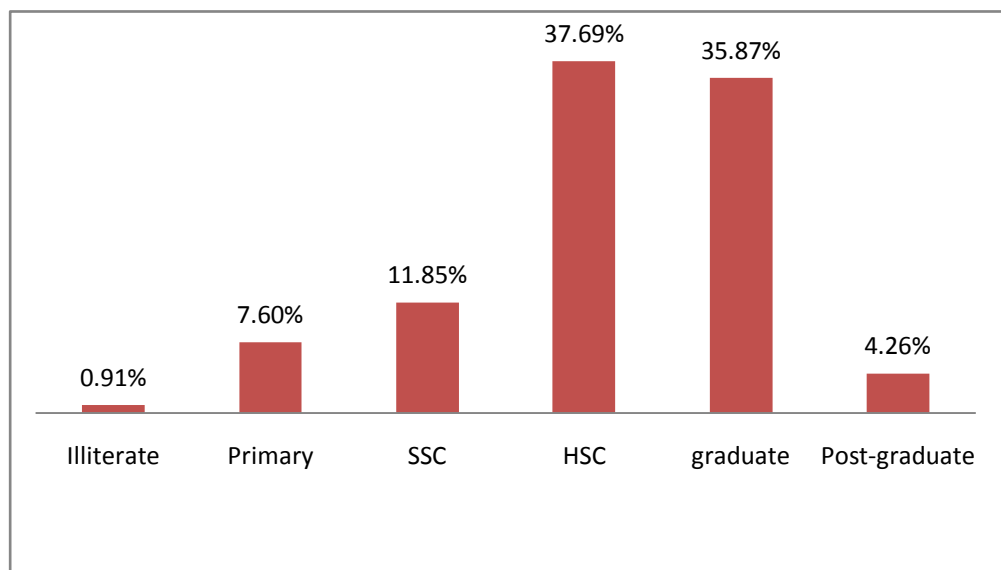
Fig 4.2: Education level

Majority of female respondents 37.69% are HSC passed, 35.87% are graduate, 11.85% passed SSC, 7.60% have primary education, 4.26% are post- graduate and the rest of them 0.91% are illiterate.

4.3 Occupational status
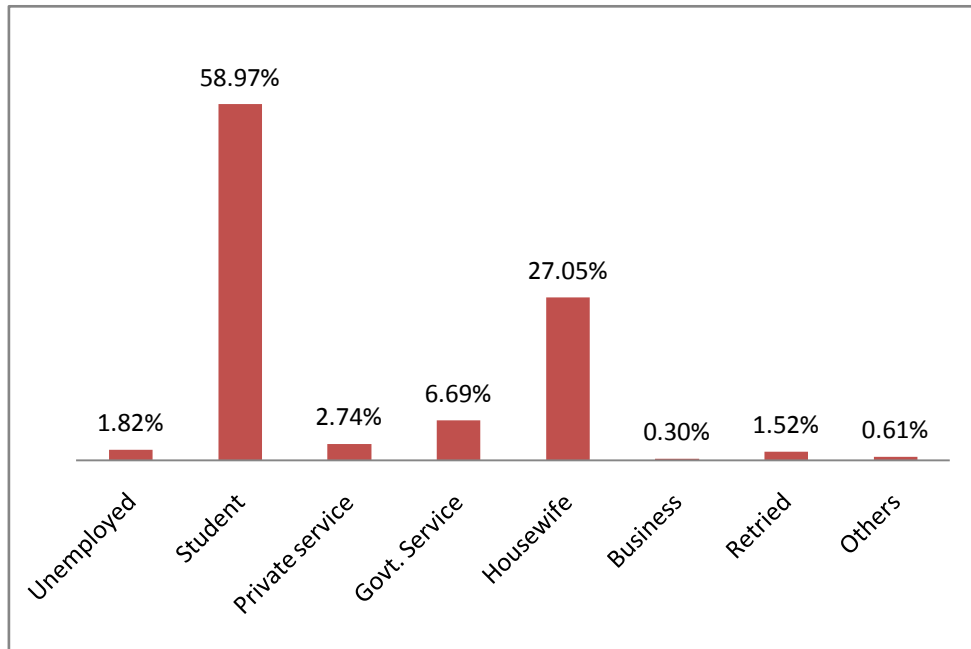
Fig 4.3: Occupational status

Among 329 female, majority 58.97% are students, 27.05% are housewife, 6.69% are Govt. service holder, 2.74% are private service holder, 1.82% are unemployed,1.52% are retried 0.61% are others and rest of them 0.30% are doing business.

4.4 Marital status
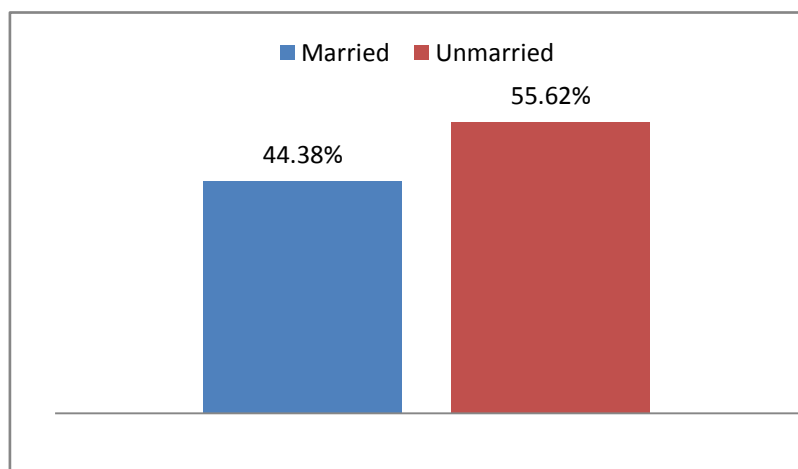
Fig 4.4: Marital status

Among them, 55.62% are married and 44.38% are unmarried.

4.5 Residential area
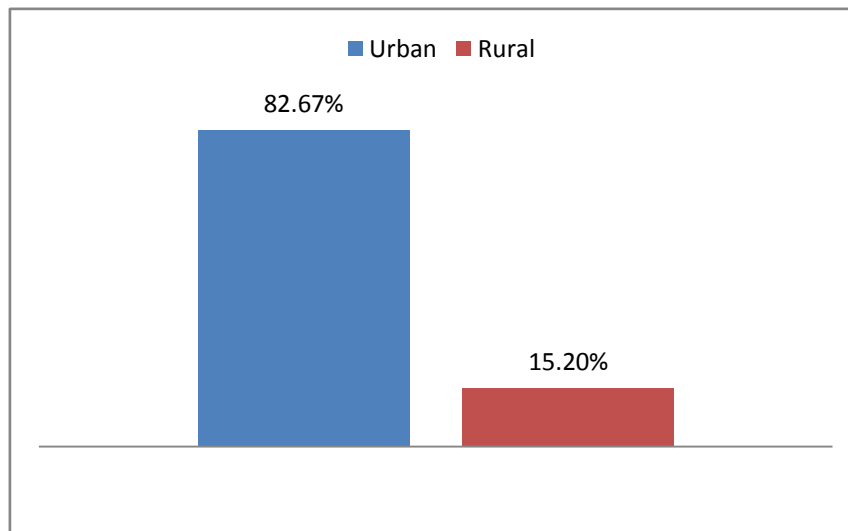
Fig 4.5: Residential area

Among 329 people, majority 82.67% are live in urban area, only 15.20% are live in rural area and 7 person do not give any answer.

4.6 Monthly income of family (taka)
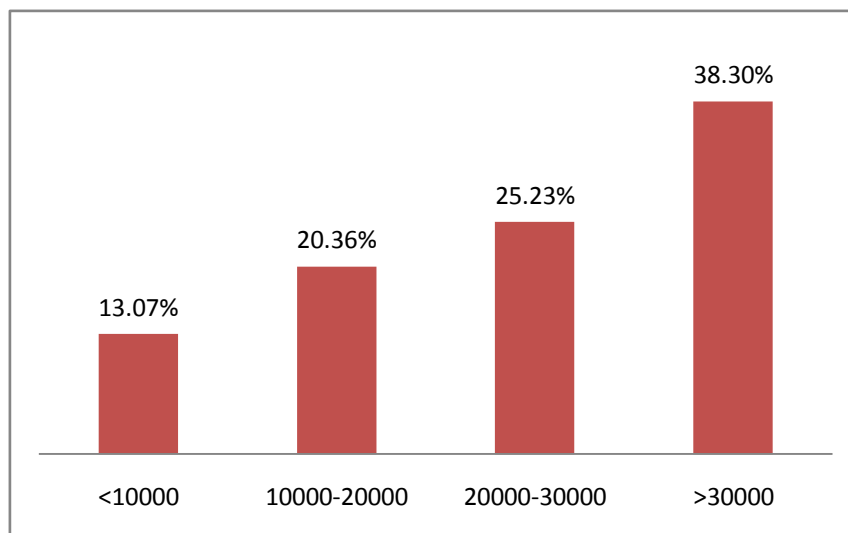
Fig 4.6: Monthly income of family (taka)

Among 329 people 320 people are given their data and according to that 38.30% family income are >30000, 25.23% peoples family income are 20000-30000, 20.36% peoples

family income are 10000-20000 and rest of them 13.07% peoples family income are <10000.

4.7 BMI status
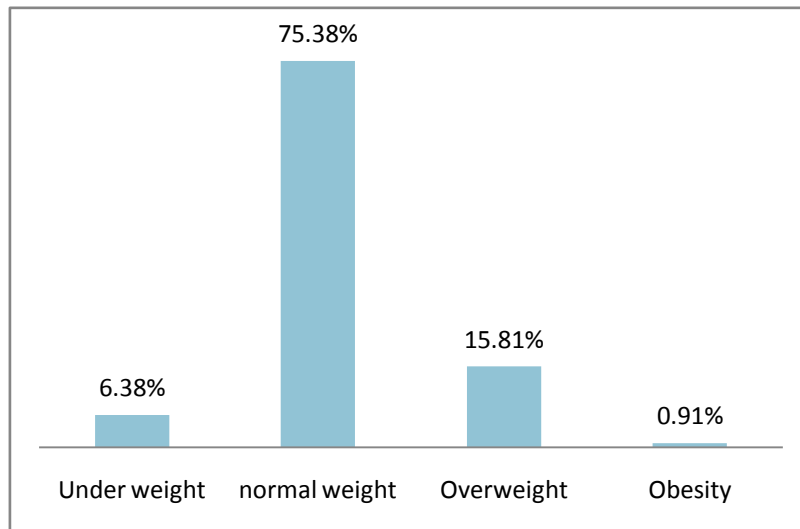
Fig 4.7: BMI status

According to BMI standard <18.5 are underweight, 18.5-24.5are normal weight, 25-29.9 are overweight and obese are >30.Here, majority 75.38% have normal weight, 6.38% are underweight, 15.81% are overweight and 0.91% are obese.

4.8 Waist Circumference
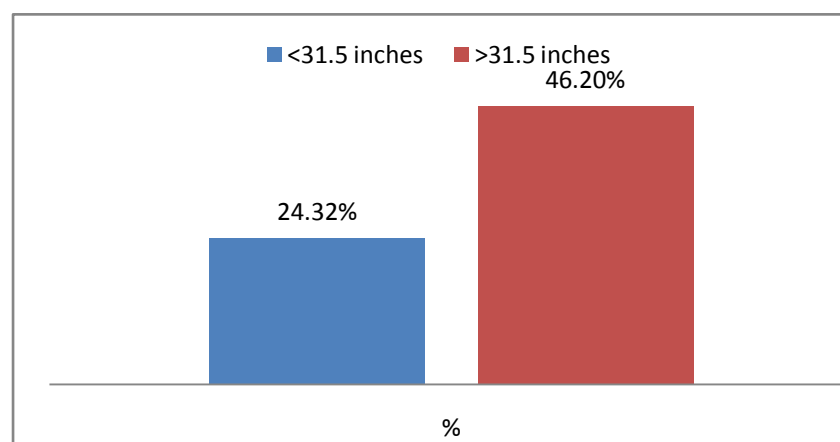
Fig 4.8: Waist Circumference

Majority 46.20% have >31.5 inches waist size that is risk for health and 24.32% have <31.5 inches waist size it is good for health.

4.9 Duration of sleep
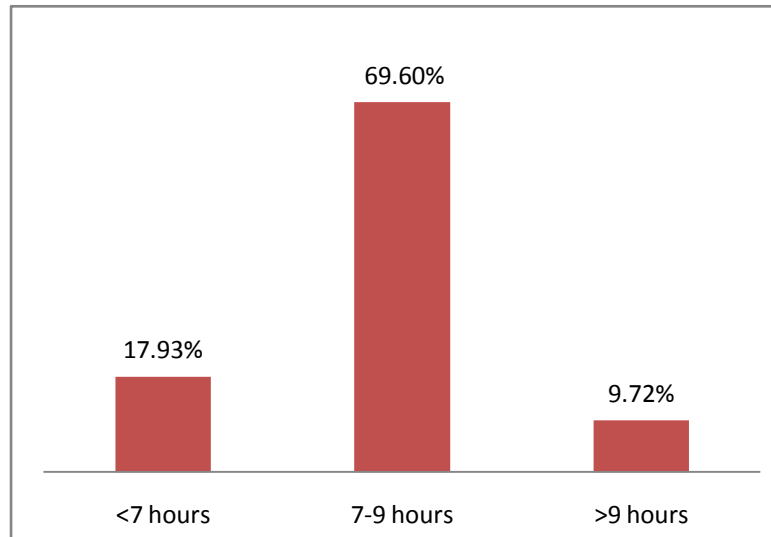
Fig 4.9: Duration of sleep

Among 329, majority(69.60)% 7-9 hours duration of sleep is good for health,(17.93)% <7 hours and rest of them (9.72)% >9 hours duration of sleep is risky for our health.

4.10 Blood pressure
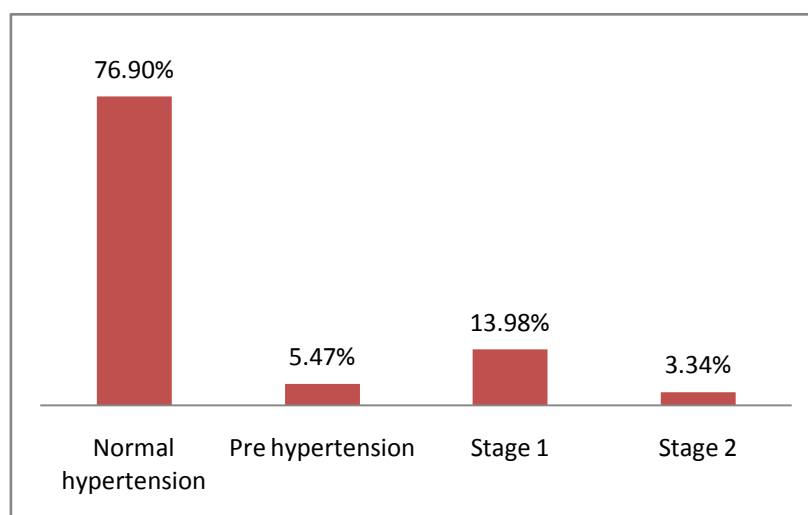
Fig 4.10: Blood pressure

Majority 76.90% people having normal blood pressure, 13.98% having stage 1 hypertension, 5.47% having pre-hypertension and 3.34% having stage 2 hypertension.

4.11 Current medical condition
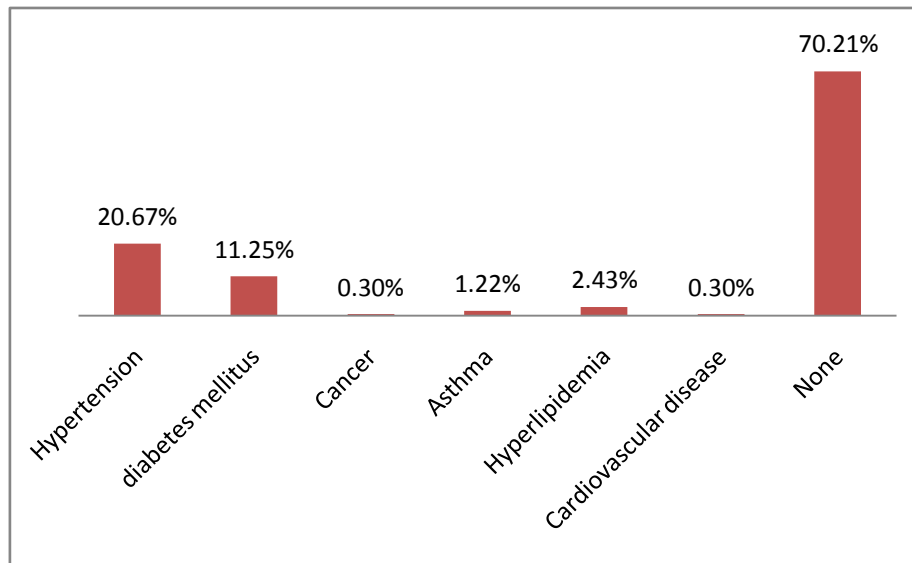
Fig 4.11: Current medical condition

Most of them 70.21% are having no disease condition, 20.67% having hypertension, 11.25% having diabetes mellitus, 2.43% having hyperlipidemia, 1.22% having asthma and 0.30% having CVS& cancer.

4.12 Family history of non-communicable disease

4.12.1 Family history of Smoking
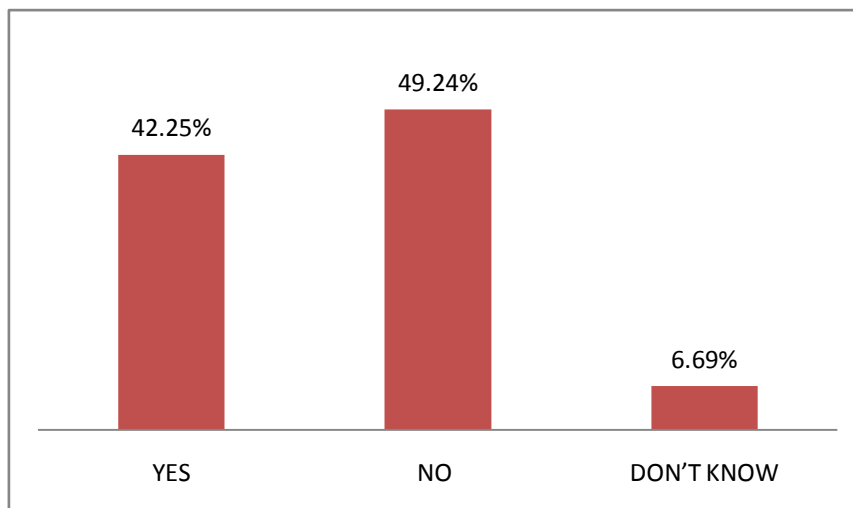
Fig 4.12.1: Family history of Smoking

Among 329 female, 49.24% having no family history of smoking, 42.25% having family history of smoking and 6.69% given data don't know.

4.12.2 Family history of Smokeless tobacco use
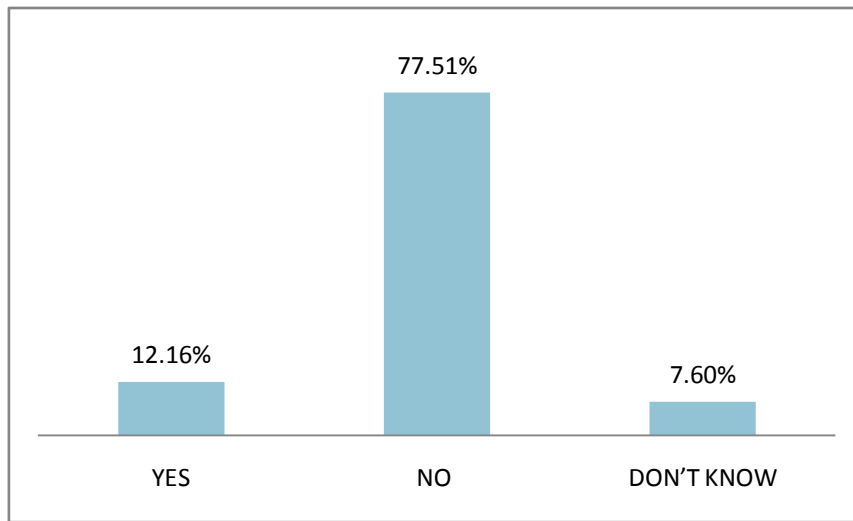
Fig 4.12.2: Family history of Smokeless tobacco use

Among 329 female, 77.51% having no family history of smokeless tobacco use, 12.16% having family history of smokeless tobacco use and 7.60% given data don't know.

4.12.3 Family history of Hypertension
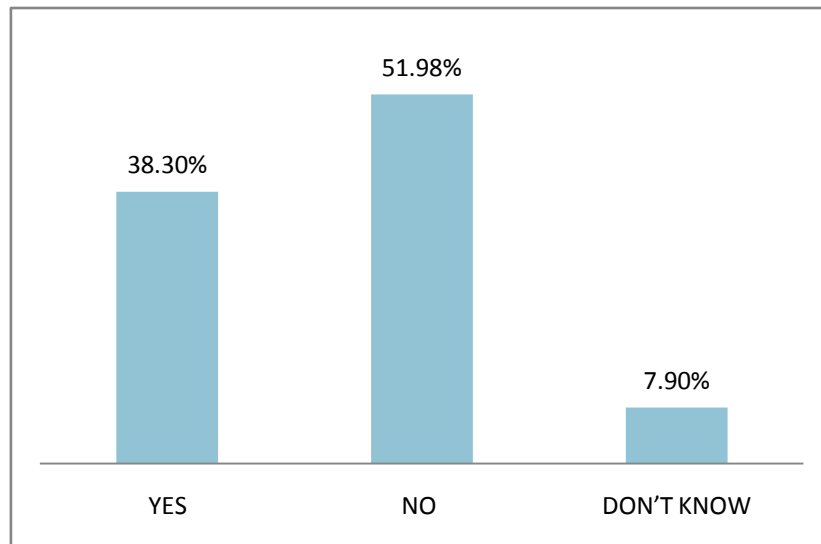
Fig 4.12.3: Family history of hypertension

Among 329 female, 51.98% having no family history of hypertension, 38.30%% having family history of hypertension and 7.90% given data don't know.

4.12.4 Family history of Diabetes Mellitus
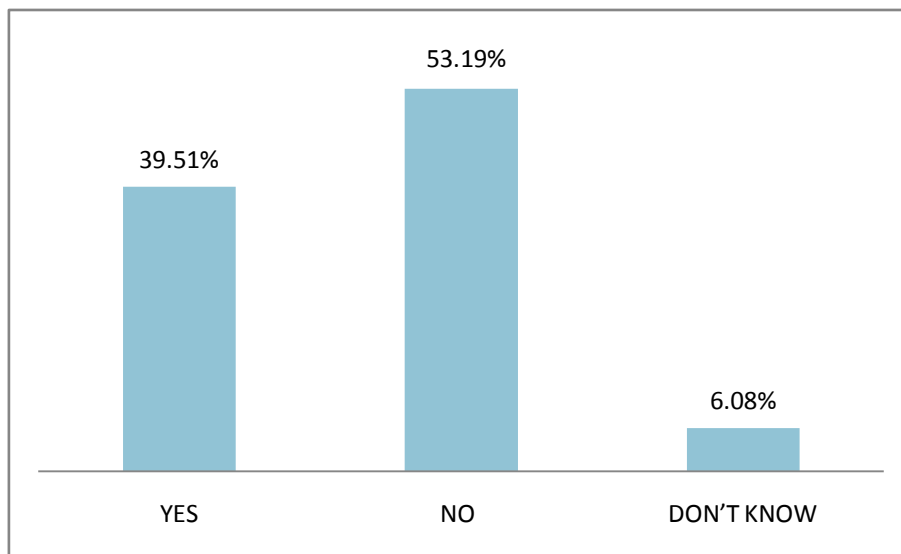
Fig 4.12.4: Family history of Diabetes Mellitus

Among 329 female, 53.19% having no family history of diabetes mellitus, 39.51%% having family history of diabetes mellitus and 6.08% given data don't know.

4.12.5 Family history of Asthma
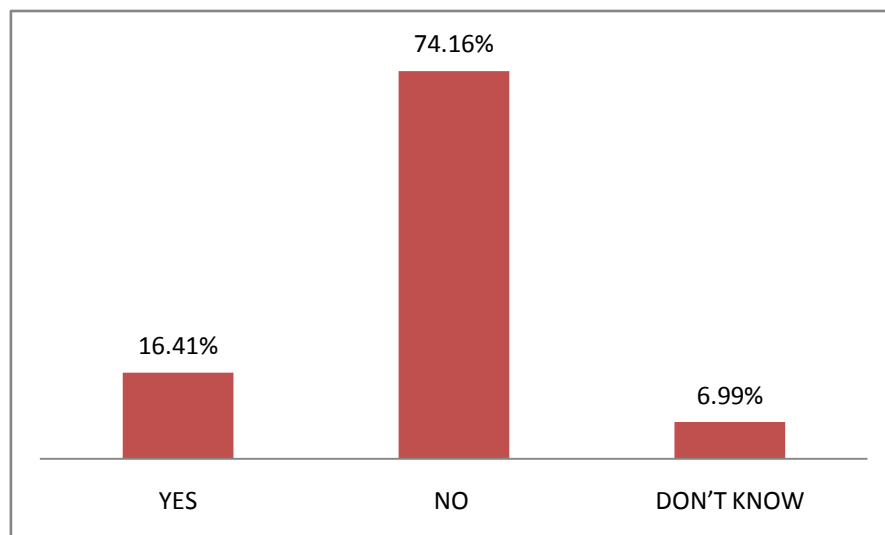
Fig 4.12.5: Family history of Asthma

Among 329 female, 74.16% having no family history of asthma, 16.41% having family history of asthma and 6.99% given data don't know.

4.12.6 Family history of Cancer
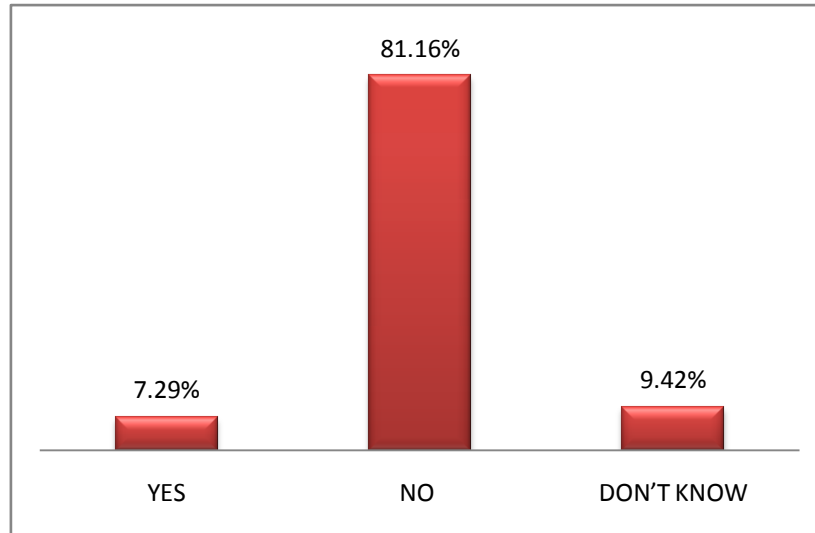
Fig 4.12.6: Family history of Cancer

Among 329 female, 81.16% having no family history of cancer, 7.29% having family history of cancer and 9.42% given data don't know.

4.13 Cause a health problem

4.13.1 Tobacco use
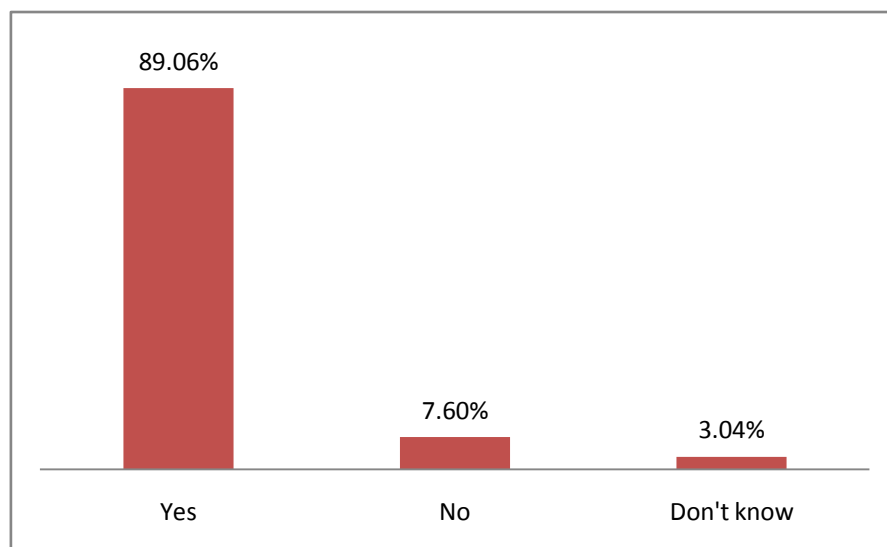
Fig 4.13.1: Tobacco use

Among 329 female, most of them 89.06% think tobacco use can cause health problem, 7.60% think tobacco use can't cause health problem and 3.04% given don't know data.

4.13.2 Excess salt intake
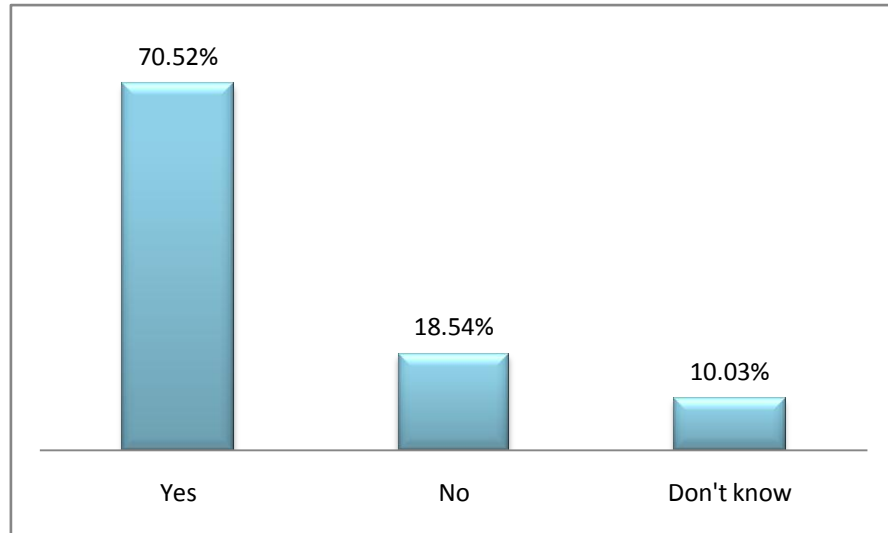
Fig 4.13.2: Excess salt intake

Majority 70.52% think excess salt intake can cause health problem, 18.54% think excess salt intake can't cause health problem and 10.03% given don't know data.
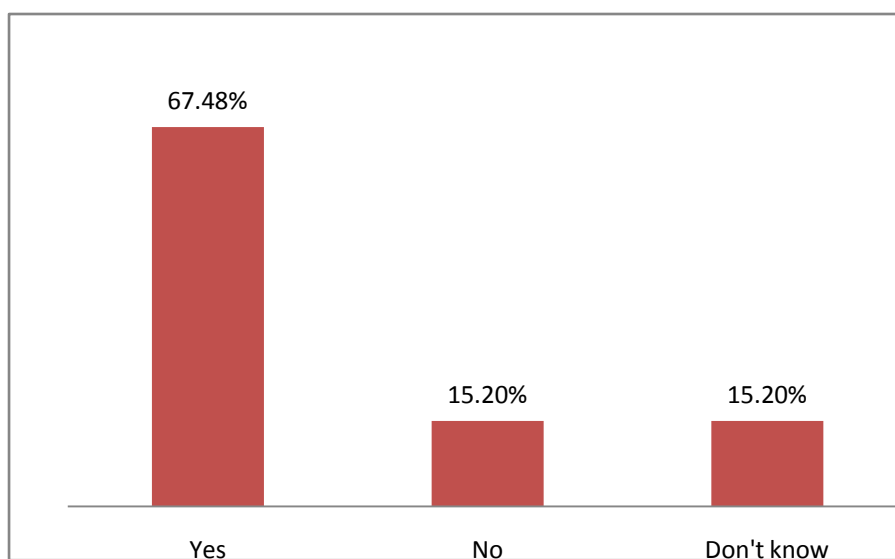
4.13.3 Physical inactivity

Fig 4.13.3: Physical inactivity

Majority 67.48% think physical inactivity can cause health problem, 15.20% think physical inactivity can't cause health problem and 15.20% given don't know data.
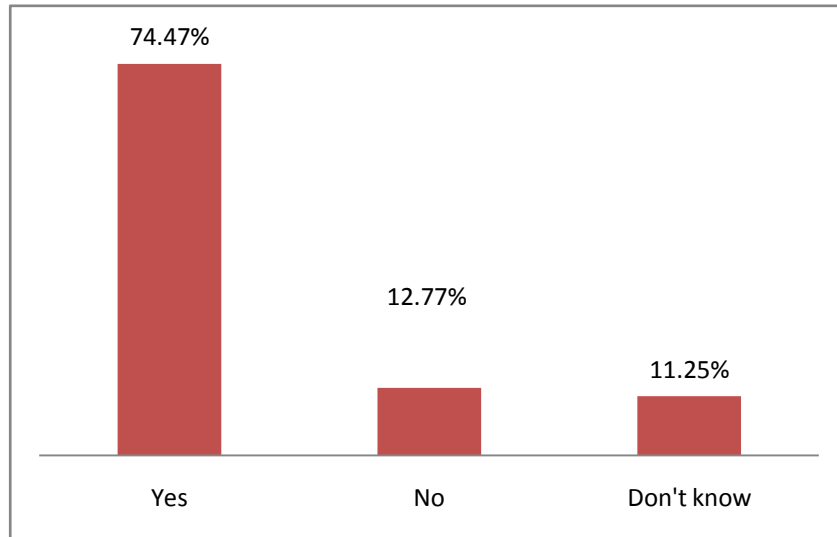
4.13.4 Overweight

Fig 4.13.4: Overweight

Majority 74.47% think overweight can cause health problem, 12.77% think overweight can't cause health problem and 11.25% given don't know data.
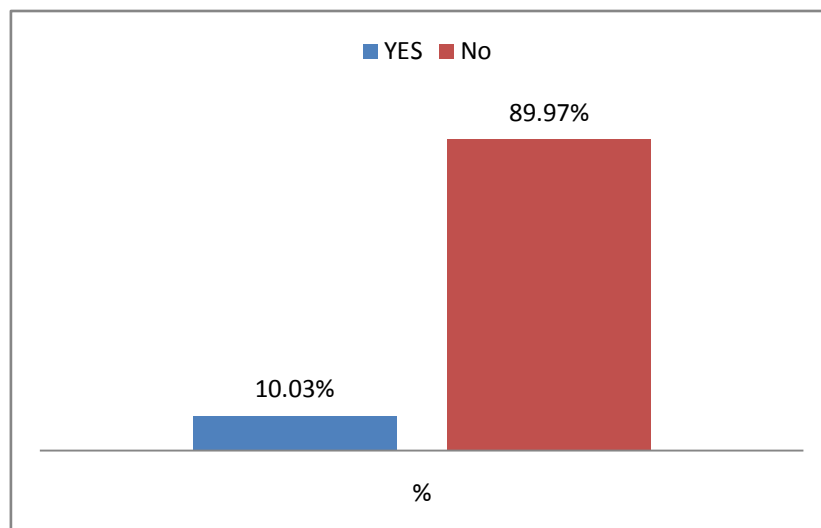
4.14 Use of tobacco within last 30 days

Fig 4.14: Use of tobacco within last 30 days

Among 329 female 89.97% do not take any tobacco products within last 30 days and 10.03% take any tobacco products within last 30 days.

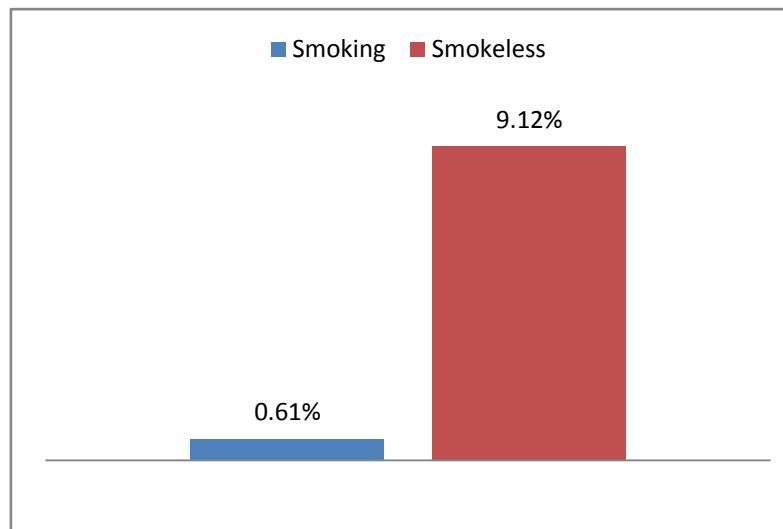**4.14.1 Type of tobacco product used by respondents**

Fig 4.14.1: Type of tobacco product used by respondents

Among 329 female, only 33 female take tobacco products. 9.12% took smokeless tobacco and 0.61% took smoking tobacco.
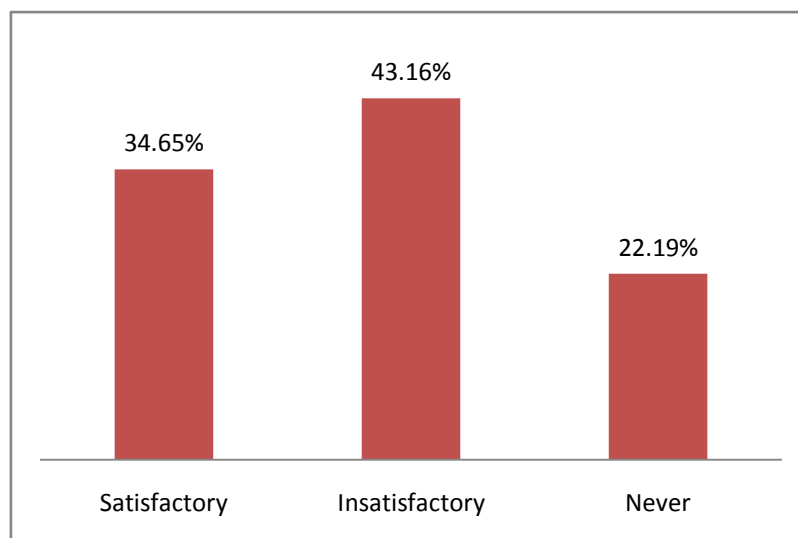
4.15 Dietary habit

4.15.1 Fruit eating habit

Fig 4.15.1: Fruit eating habit

For our study we take ≥5 days/week eating fruit habit is satisfactory. Among 329 female, 34.65% females eating fruit is satisfactory and 43.16% females eating fruit is unsatisfactory and 22.19% female never eat fruit.
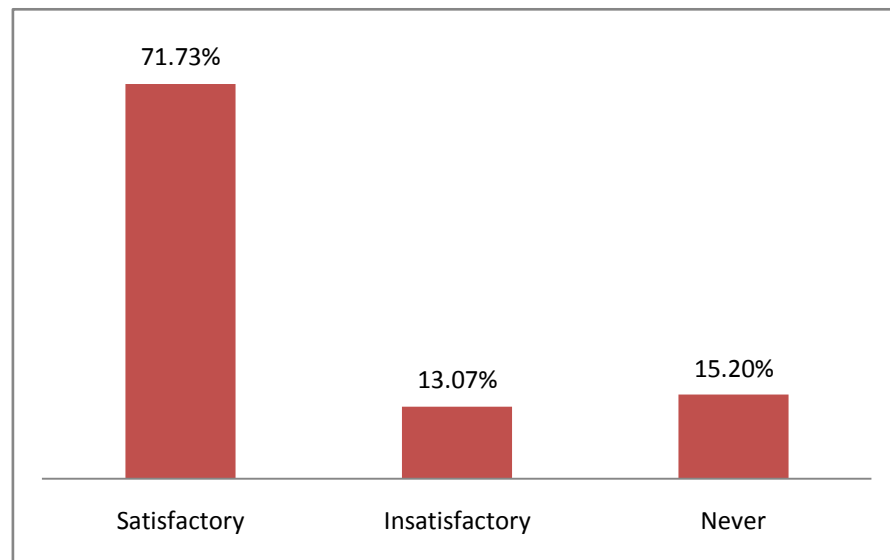
4.15.2 Vegetable eating habit

Fig 4.15.2: Vegetable eating habit

For our study we take ≥5 days/week eating vegetable habit is satisfactory. Among 329 female, 71.73% females eating vegetable is satisfactory 13.07% females eating vegetable is unsatisfactory and 22.19% female never eat vegetable.

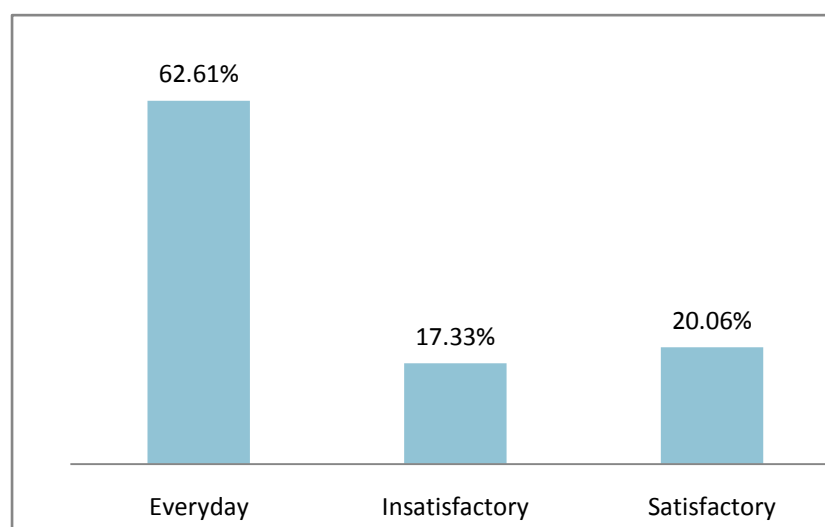**4.15.3 Eating meals outside**

Fig 4.15.3: Eating meals outside

Among 329 female, 20.06% females eating meals is satisfactory 17.33% females eating meals is unsatisfactory and 62.61% female everyday eating meals outside at home.
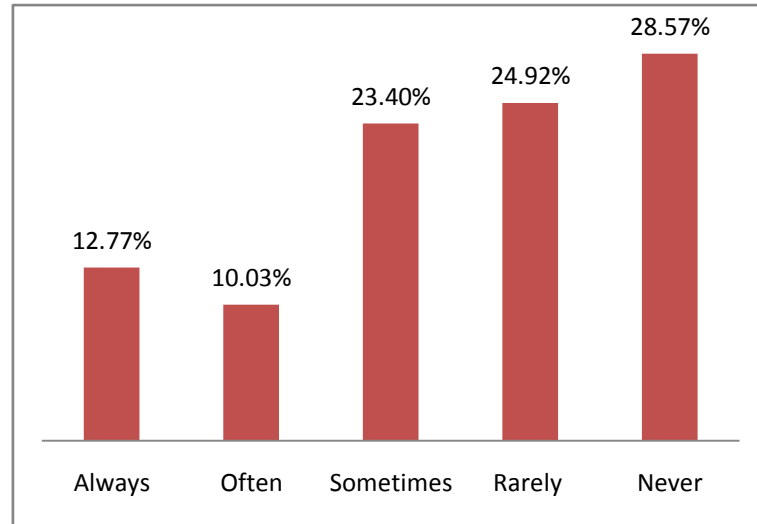
4.16 Add salt or salty sauce

Fig 4.16: Add salt or salty sauce

Among 329 female, majority 28.57% never add salt to food, 24.92% rarely add salt to food, 23.40% sometimes add salt to food,12.77% always add salt to food and 10.03% often add salt to food .
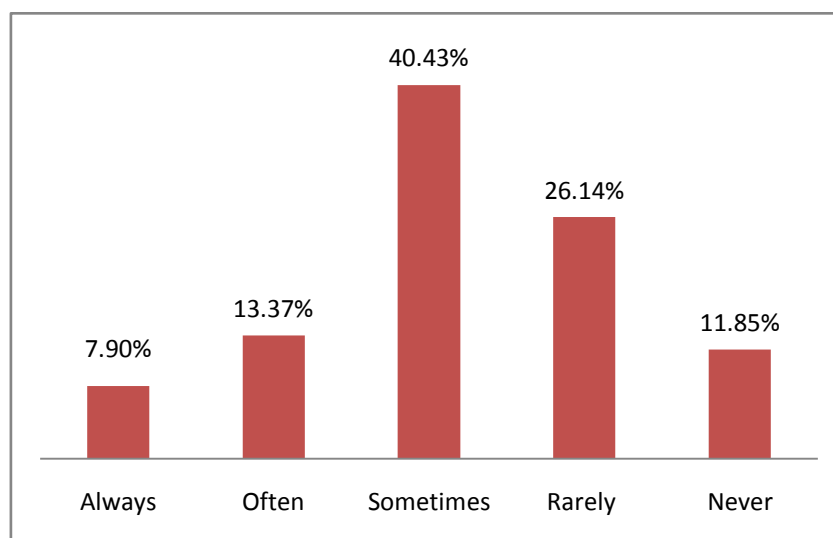
4.17 Often salt

Fig 4.17: Often salt

Among 329 female, majority 40.43% sometimes eat processed food high in salt, 26.14% eat rarely, 13.37% eat often, 11.85% eat never and 7.90 % always eat processed food high in salt.
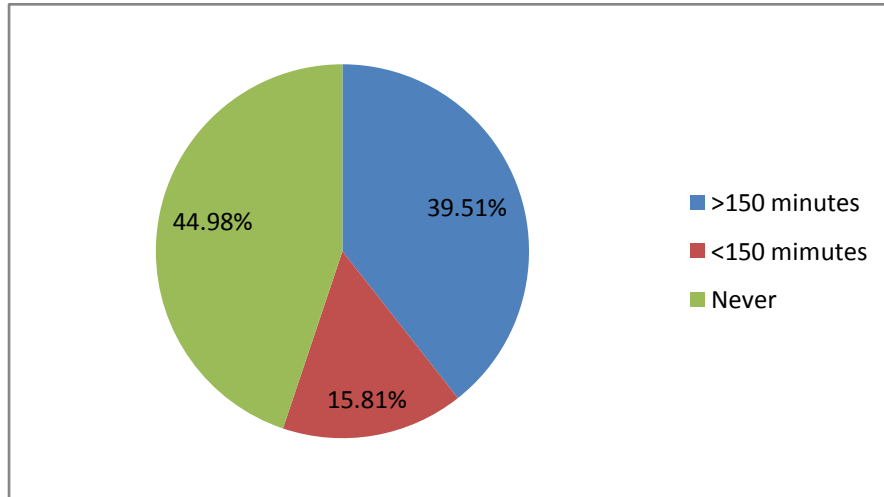
4.18 Physical activity

Fig 4.18: Physical activity

Among 329 female, majority 44.98% never do any physical activity, 39.51% female's physical activity is satisfactory and 15.81% females Physical activity is unsatisfactory.

4.19 Sitting or reclining time
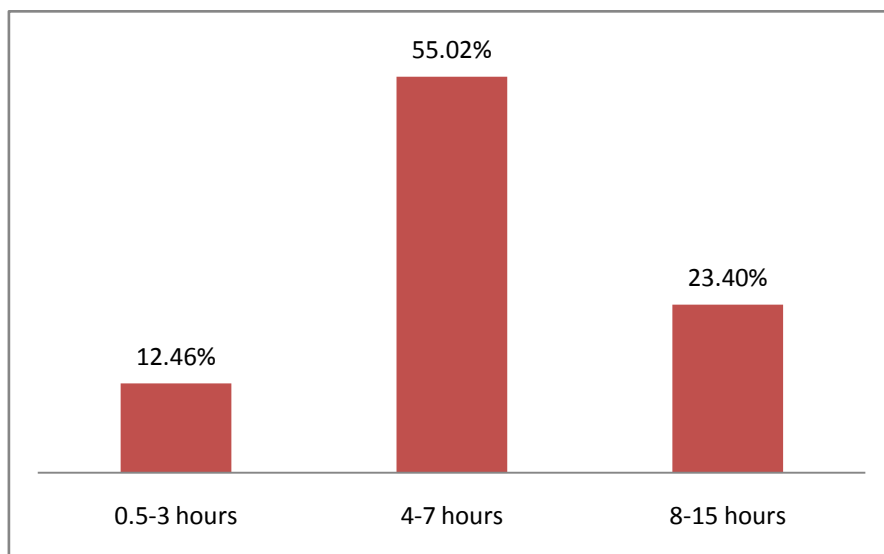
Fig 4.19: Sitting or reclining time

Among 329 female, majority 55.02% female's sitting time is 4-7 hours, 23.40% female's sitting time is 8-15 hours and the rest of them 12.46% female's sitting time is0.5-3 hours on an average day.

4.20 Doctor or health worker advice

4.20.1 Advice of not smoking
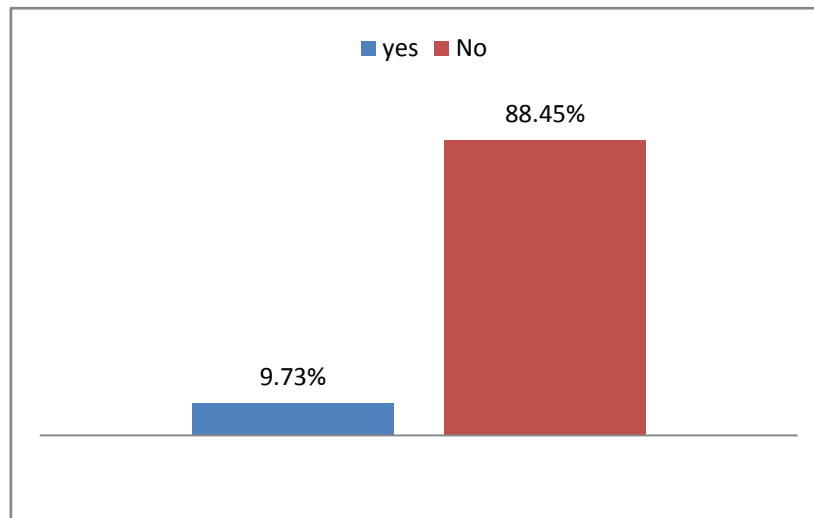
Fig 4.20.1: Advice of not smoking

Among 329 female, majority 88.45% female are having no advice of not smoking and 9.73% female are having advice of not smoking.

4.20.2 Advice of reduce salt intake
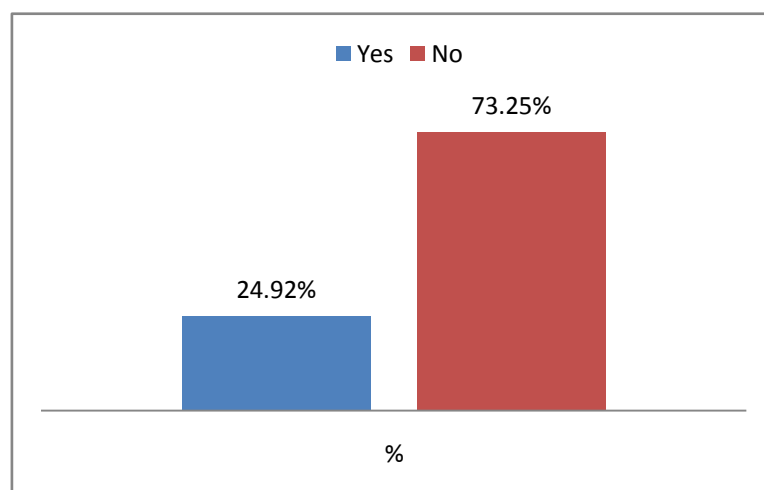
Fig 4.20.2: Advice of reduce salt intake

Among 329 female, majority 73.25% female are having no advice of reduce salt intake and 24.92% female are having advice of reduce salt intake.

4.20.3 Advice of taking fruit and vegetable
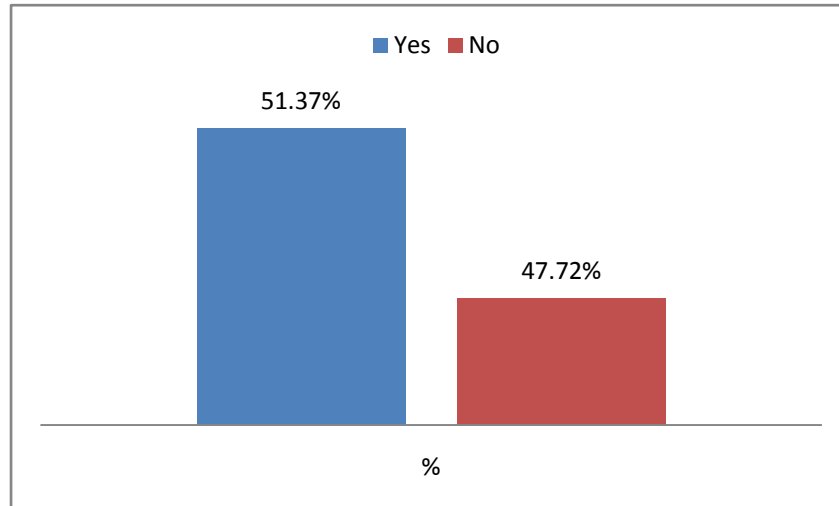
Fig 4.20.3: Advice of taking fruit and vegetable

Majority 51.37% female are having no advice of taking fruit and vegetable and 47.72% female are having advice of taking fruit and vegetable.

4.20.4 Advice of reduce fat in diet
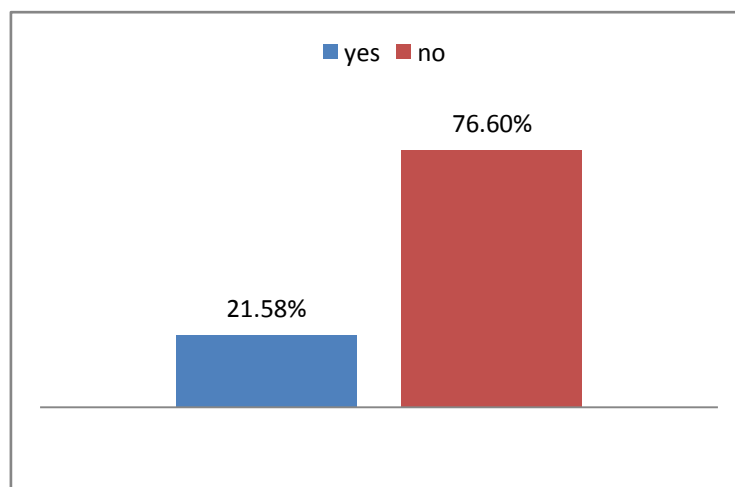
Fig 4.20.4: Advice of reduce fat in diet

Majority 76.60% female are having no advice of reduce fat in diet and 21.58% female are having advice of reduce fat in diet.

4.20.5 Advice of physical activity

Fig 4.20.5: Advice of physical activity

Majority 68.39% female are having no advice of physical activity and 30.09% female are having advice of physical activity.

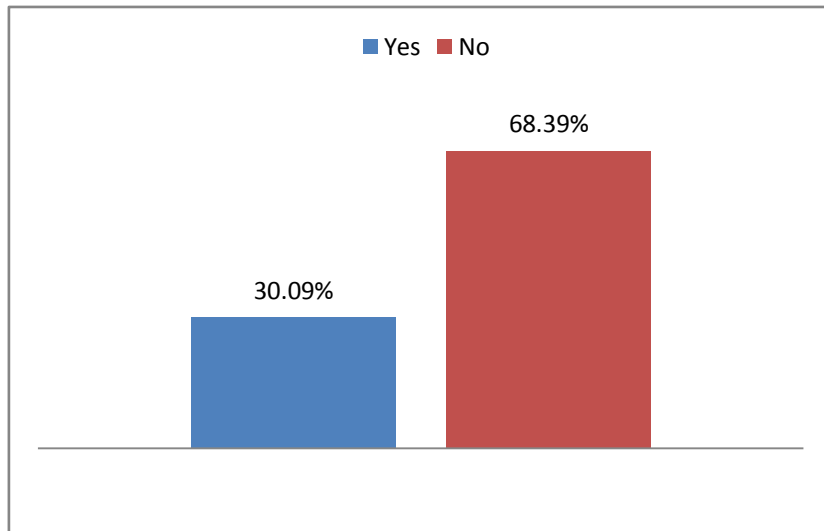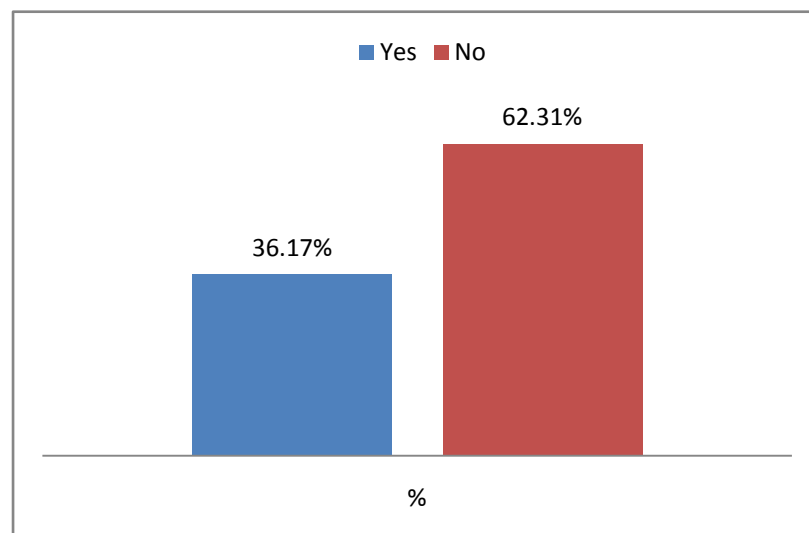## 4.20.6 Advice of maintaining body weight

Fig 4.20.6: Advice of maintaining body weight

Majority 62.31% female are having no advice of maintaining body weight and 36.17% female are having advice of maintaining body weight.

Chapter 5
Discussion

5 Discussions

For our survey we collect data among 329 female respondents. In the present study, the prevalence of selected risk factors for NCDs varied greatly. Many risk factors were quite common among Bangladeshi women aged 18 years or older. The prevalence of risk factor varied considerably. Most of the female respondents were between 21-30 years (56.84%) age. Majority of female respondents were HSC passed (37.69%) and students (58.97%). 20.67% have hypertension.

In our study (70.21%) of the respondents informed that they were not suffering from any NCD. Around 11.25% have diabetes mellitus. Genetics play an important role in occurring DM. Globally, 6% of deaths are caused by high blood glucose, with 83% of those deaths occurring in low- and middle-income countries. The age-specific risk of dying from high blood glucose is lowest in high-income countries and the WHO Western Pacific Region. Raised blood glucose causes all diabetes deaths, 22% of ischemic heart disease and 16% of stroke deaths (WHO, 2009). In our study, 39.51% have a family history of DM.

Although 20.67% mentioned about having hypertension and 38.30% have positive family history of hypertension, in practical measurement it was found that 13.98% stage 1 hypertension and 3.34% stage 2 hypertension. Average blood pressure levels are particularly high in middle-income European countries and African countries. Globally, 51% of stroke (cerebrovascular disease) and 45% of ischemic heart disease deaths are attributable to high systolic blood pressure. At any given age, the risk of dying from high blood pressure in low- and middle-income countries is more than double that in high-income countries. In the high income countries, only 7% of deaths caused by high blood pressure occur under age 60; in the African Region, this increase to 25%. Diet especially too much salt – alcohol, lack of exercise and obesity all raise blood pressure, and these effects accumulate with age (WHO, 2009).

In our study following majority (75.38%) female persons have normal BMI status. But 15.81% female were overweight and 0.91% were found obese. WHO estimates that, in 2005, more than 1 billion people worldwide were overweight and more than 300 million were obese. Overweight and obesity are increasing worldwide due to changes in diet and increasing physical inactivity. In 2015 1.5 billion people are overweight. Average BMI is highest in the Americas, Europe and the Eastern Mediterranean. Globally, 44% of

diabetes burden, 23% of ischemic heart disease burden and 7–41% of certain cancer burdens are attributable to overweight and obesity. In both South-East Asia and Africa, 41% of deaths caused by high body mass index occur under age 60, compared with 18% in high-income countries (WHO, 2009).

Also 46.20% females have risk of health because of their waist size ≥80cm or (31.5 inches).

In this study only 39.51% female's physical activity was satisfactory but that is much lower than the proportion of respondents who remains physically inactive (44.98%). Physical activity reduces the risk of cardiovascular disease, some cancers and type 2 diabetes. It can also improve musculoskeletal health, control body weight and reduce symptoms of depression. In high-income countries, most activity occurs during leisure time, while in low-income countries most activity occurs during work, chores or transport. Physical inactivity is estimated to cause around 21–25% of breast and colon cancer burden, 27% of diabetes and about 30% of ischemic heart disease burden (WHO, 2009).

 In our study we considered the satisfactory level of fruit intake as 5 days/week. Insufficient intake of fruit found in this study was much lower (34.65%) but intake of vegetables were better (71.73%). Number of days in a week with vegetables consumption is particularly high in Bangladeshi population. Insufficient intake of fruit and vegetables is estimated to cause around 14% of gastrointestinal cancer deaths, about 11% of ischemic heart disease deaths and about 9% of stroke deaths worldwide. Most of the benefit of consuming fruits and vegetables comes from reduction in cardiovascular disease, but fruits and vegetables also prevent cancer. Rates of deaths and DALYs attributed to low fruit and vegetable intake are highest in middle-income European countries and in South-East Asia (WHO, 2009).

In context of eating food outside, only 20.06% were in satisfactory level but majority (62.71%) was in unsatisfactory conditions as they have them daily.

In this study 12.77% female always add salt to diet and7.90 % always eat processed food high in salt that is so much bad for health.. In our study 2.43% female are having hyperlipidemia. Diets high in saturated fat, physical inactivity and genetics can increase

cholesterol levels. Globally, one third of ischemic heart disease is attributable to high blood cholesterol. High blood cholesterol increases the risk of heart disease, most in the middle-income European countries, and least in the low- and middle-income countries in Asia (WHO, 2009).

In our country less use of tobacco is a socio-economical factor for female person. From this study 10.03% female respondent uses tobacco within last 30 days and the type of using tobacco was 9.12% smokeless tobacco and 0.61% smoking tobacco. Majority (smoking 42.25% & smokeless 12.16%) have positive family history of tobacco.

Again in our study the respondents knew that health problems can be caused by tobacco use (89.06%), excess salt intake (70.52%), physical inactivity (67.48%) and overweight (74.47%).

It was observed that, physicians advised some of the study population to not smoking 9.73%, reduce salt intake 24.92%, reduce fat in diet 21.58%, physical activity 30.09%, maintaining body weight 36.17%. But their BMI is not the range of normal weight. It had been found that the knowledge about respondents about risk factors of NCD was good as they were educated. But they had lack of consciousness and do not obey the advices provided by physicians. So, efforts should be made by Govt. and Non-Governmental agencies to improve the knowledge about NCDs.

Chapter 6
Conclusion

Conclusion

The results of the present study revealed that the prevalence of non-communicable disease among the respondents were low. But presence of behavioral and biological risk factors such as increased waist circumference, physical inactivity and longer duration spending in sitting and reclining etc. were found in a high percentage although and majority had normal BMI. It had been found that the knowledge about respondents about risk factors of NCD was good as they were educated. But they had lack of consciousness and do not obey the advices provided by physicians. So, efforts should be made by Govt. and Non-Governmental agencies to improve the knowledge about NCDs. Further studies can be done by widening the study area and population to get a better idea about NCDs in our country.

Chapter 7

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