A Comparative Study on Risk Factors of Non-Communicable Diseases between Rural & Urban Area of Bangladesh

A Research Paper Submitted to the Department of Pharmacy for the Partial Fulfillment of the Degree of Bachelor of Pharmacy.

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DECLARATION BY THE RESEARCH CANDIDATE

I, **A.B.M Asikur Rahman, ID: 2014-1-70-013,** hereby declare that the dissertation entitled **"A comparative Study on Risk Factors Determination of Non-Communicable Diseases between Rural & Urban Area of Bangladesh"** submitted to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the degree of Bachelor of Pharmacy (Honors) 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 **"A comparative Study on Risk Factors of Non-Communicable Diseases between Rural & Urban area of Bangladesh"** is a bonafide research work done by **A.B.M Asikur Rahman (2014-1-70-013)** in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy under my supervision.

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DEDICATION

*This research paper is dedicated to my respected parents **Md. Matiur Rahman & Ms. Akhter Jahan** and my beloved sibling **A.B.M Ganiur Rahman** & my sister in law **Afsana Akter Shimu** for their unconditional support.*

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Abstract

Bangladesh is enduring rapid demographic and epidemiological transitions, with an increasing

older population and a shifting disease burden from infectious, communicable diseases to chronic, non-communicable diseases (NCDs). This study was done to determine and compare the prevalence of common risk factors for major NCDs among 270 adults from urban and rural areas (1:1 ratio) of Bangladesh by using a structured questionnaire. Majority (36.67%) of them aged between 31-40 years and most of them were male (58.15%). Urban population were more educated than rural population and 7.78% population in rural area were illiterate. Although prevalence of diabetes mellitus was same (17.04%) among populations from both areas, hypertension and overweight were present in higher proportion among the urban population than rural (43.70% *vs.* 25.93%, 54.07% *vs.* 2741% respectively). Family history of these two conditions were also found high among the study population. More than half of the population from both areas were found pre-hypertensive during their BP measurement. Majority of the total population were aware of the bad impacts of overweight, tobacco use and salt intake on health. But the level of using smokeless tobacco was quite high among both areas while salt intake was higher in rural population than urban population. Around half of total population have satisfactory level of physical activity. The better part of the respondents took fruits and vegetable 5 or more days per week but didn't comply with the standard. A prominent portion of the study populations were advised by doctors to change their lifestyle but the result showed their lack of unwillingness especially in urban area. After analysis it can be mentioned that respondents had enough knowledge about the association of health problems with the modifiable risk factors of NCDs but they had the lack of proper practice. Intervention at all levels of society is essential for preventing the spread of NCD by increasing awareness of people about a perfect & healthy lifestyle and by motivating them to act accordingly.

Keywords: *Non Communicable Diseases, Modifiable risk factors, Non-modifiable risk factors, Comparison, Bangladesh.*

Chapter One

Introduction

1.1 NCDs

NCDs (noncommunicable diseases) are the 1 cause of death and disability worldwide. Noncommunicable diseases (NCDs) – mainly cancer, cardiovascular disease, chronic respiratory diseases, and diabetes – are the most common cause of death and disability worldwide, accounting for 70% of all deaths and more than three out of four years lived with a disability.70% of global deaths are attributable to noncommunicable diseases (NCDs)NCDs are diseases which are not transmissible from person to personEach year, 15 million people aged 30-69 die from a NCD.86% of premature NCD deaths occur in low and middle income countries (LMICs).Most NCDs are preventable (NCD Alliance, 2015).

1.2 Non Communicable Diseases List

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. Below is a noncommunicable diseases list:

Genetic diseases	Environmental diseases
• Achondroplasia	• Appendicitis
• Albinism	• Anorexia nervosa
• Bardet-Biedl syndrome	• Arteriosclerosis
• Bipolar disorder	• Asthma
• Canavan disease	• Carpal tunnel syndrome
• Color blindness	• Chronic obstructive pulmonary diseases
• Cystic fibrosis	
• Down's syndrome	• Emphyema
• Fragile X syndrome	• Fetal alcohol syndrome
• Galactosemia	• Glaucoma
• Hemophilia	• Fibromyalgia

• Krabbe disease	• Hyperthyroidism
• Muscular dystrophy	• Hypothyroidism
• Neurofibromatosis	• Irritable Bowel Syndrome
• Noonan syndrome	• Liver cirrhosis
• Osteogenesis	• Narcolepsy
• Patau syndrome	• Osteoporosis
• Sickle-cell disease	• Sudden infant death syndrome (SIDS)
• Tay-Sachs disease	• Tick paralysis
• Triple X syndrome	
• Turner syndrome	
• Usher syndrome	
• Von Hippel-Lindau syndrome	
• Waardenburg syndrome	
• Wilson's disease	
• Xeroderma pigmentosum	

(Just-Health. 2017)

1.3 Major Non Communicable Diseases

1.3.1 Diabetes

1.3.1.1 Type 1 Diabetes Mellitus

In type 1 diabetes, the pancreas is unable to produce any insulin, the hormone that controls blood sugar levels. Insulin production becomes inadequate for the control of blood glucose levels due to the gradual destruction of beta cells in the pancreas. This destruction progresses without notice over time until the mass of these cells decreases to the extent that the amount of insulin produced is insufficient. When it develops later in

life, type 1 diabetes can be mistaken initially for type 2 diabetes. Correctly diagnosed, it is known as latent autoimmune diabetes of adulthood (Medical News Today, 2016a).

1.3.1.1.1 Causes of type 1 Diabetes Mellitus

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.

Although the mechanisms of type 1 diabetes etiology are unclear, they are thought to involve the interaction of multiple factors:

- 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 (Medical News Today, 2016a).

1.3.1.2 Type 2 diabetes Mellitus

The body does not produce enough insulin for proper function, or the cells in the body do not react to insulin (insulin resistance). Type 2 diabetes mellitus more likely to occur in adult people who are overweight and physically inactive. Unlike type 1 diabetes which currently cannot be prevented, many of the risk factors for type 2 diabetes can be modified. For many people, therefore, it is possible to prevent the condition (Medical News Today, 2016b).

1.3.1.2.1 Sign & Symptoms of type 2 Diabetes Mellitus

The International Diabetes Foundation highlight four symptoms that signal the need for diabetes testing:

1. Frequent urination

2. Weight loss

3. Lack of energy

4. Excessive thirst (Medical News Today, 2016b).

1.3.1.2.2 Causes & Risk Factor of type 2 Diabetes Mellitus

Insulin resistance is usually the precursor to type 2 diabetes - a condition in which more insulin than usual is needed for glucose to enter cells. Insulin resistance in the liver results in more glucose production while resistance in peripheral tissues means glucose uptake is impaired. The impairment stimulates the pancreas to make more insulin but eventually the pancreas is unable to make enough to prevent blood sugar levels from rising too high.

The risk of developing type 2 diabetes is also greater as we get older. Experts are not completely sure why, but say that as we age we tend to put on weight and become less physically active. Those with a close relative who had/had type 2 diabetes, people of Middle Eastern, African, or South Asian descent also have a higher risk of developing the disease.

Men whose testosterone levels are low have been found to have a higher risk of developing type 2 diabetes.

Genetics plays a part in type 2 diabetes - relatives of people with the disease are at a higher risk, and the prevalence of the condition is higher in particular among Native Americans, Hispanic and Asian people.

Obesity and weight gain are important factors that lead to insulin resistance and type 2 diabetes, with genetics, diet, exercise and lifestyle all playing a part. Body fat has hormonal effects on the effect of insulin and glucose metabolism (Medical News Today, 2016b).

1.3.1.3 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% to 20% 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. Scientists from the National Institutes of Health and Harvard University found that women whose diets before becoming pregnant were high in animal fat and cholesterol had a higher risk for gestational diabetes, compared to their counterparts whose diets were low in cholesterol and animal fats (Medical News Today, 2016c).

1.3.1.4 Pre diabetes

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 (Medical News Today, 2016d).

1.3.1.5 Symptoms of Diabetes Mellitus

It is possible to have diabetes with only very mild symptoms or without developing any symptoms at all. A condition known as prediabetes that often leads to type 2 diabetes also produces no symptoms. The most common symptoms are related to hyperglycemia (high blood sugar levels).

Common symptoms of diabetes mellitus

The most common signs and symptoms of diabetes are:

- Frequent urination

- Disproportionate thirst

- Intense hunger

- Weight gain

- Unusual weight loss

- Increased fatigue

- Irritability

- Blurred vision

- Cuts and bruises don't heal properly or quickly

- More skin and/or yeast infections

- Itchy skin

- Gums are red and/or swollen - Gums pull away from teeth

- Frequent gum disease/infection

- Sexual dysfunction among men

- Numbness or tingling, especially in your feet and hands (Medical News Today, 2016e).

1.3.1.6 Diagnosis of Diabetes Mellitus

Accurate tests are available to definitively confirm a diagnosis of diabetes. Before tests are conducted, a diagnosis may be suspected when patients report certain symptoms. Doctors will evaluate the symptoms by asking questions about the patient's medical history. Doctors may also carry out a physical examination, including checks for complications that could have already developed - examining the feet for changes in sensation, for example. Testing can be part of routine screening for people at risk of the disease, who may show up as having prediabetes.

Blood tests for Diabetes Mellitus

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. When the fasting plasma glucose test is used to confirm symptoms, diabetes is diagnosed at levels equal to or above 126 mg/dL (7.0 mmol/L).

- Glycosylated hemoglobin (HbA1c) - to measure a marker of the average blood glucose level over the past 2-3 months. To make an initial diagnosis, an HbA1c reading must be 6.5% or higher. An A1C result between 5.7% and 6.4% indicates prediabetes and a risk of type 2 diabetes. Glycosylated hemoglobin is often abbreviated to A1C, and this blood test is also used in the monitoring of diabetes management.

- 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). For oral glucose tolerance testing, the plasma glucose levels after 2 hours need to be equal to or above 200 mg/dL (11.1 mmol/L) for a diabetes diagnosis.

- Another blood test is the random plasma glucose test - taken regardless of time and eating - which diagnoses diabetes if the level is at least 200 mg/dL (11.1 mmol/L). Unless the clinical picture is clear, a positive blood test should also be repeated to rule out laboratory error.

The HbA1c is the preferred blood test for diagnosis because - while it is more expensive than the FPG test - it has advantages, including:

- Greater convenience (no need for fasting)

- Less day-to-day variation during stress and illness.

Urine tests for Diabetes Mellitus

Urine tests are no longer used to make a diagnosis of diabetes, although they were once common. Blood tests are used instead because urine tests are not sensitive or specific enough and offer only a crude indication of high blood sugar levels. 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 (Medical News Today, 2016f).

1.3.2 Hypertension

Hypertension is another name for high blood pressure. It can severely impact quality of life and it increases the risk of heart disease, stroke, and death. Hypertension and heart disease are global problems. The American Heart Association (AHA) defines the following ranges of blood pressure (in mmHg):

	Systolic pressure (mmHg)	Diastolic pressure (mmHg)
Normal blood pressure	120	80
Prehypertension	Between 120-139	Between 80-89
Stage-1 hypertension	Between 140-159	Between 90-99
Stage-2 hypertension	Between 160-179	100
Hypertensive crisis	180	110

If, when taking blood pressure, the reading shows a hypertensive crisis, the person should wait 2 or 3 minutes and then repeat the test (Medical News Today, 2017a).

1.3.2.1 Types & Causes of Hypertension

Blood pressure varies throughout the day. It is lower during sleep and higher on awakening. Occasionally having high blood pressure for a short time is a normal physiological response to many situations.

Primary hypertension can result from multiple factors, including blood plasma volume and activity of the hormones that regulate of blood volume and pressure. It is also influenced by environmental factors, such as stress and lack of exercise.

Secondary hypertension has specific causes and is a complication of another problem.

It can result from:

1. Diabetes, due to both kidney problems and nerve damage
2. Kidney disease
3. Pheochromocytoma, a rare cancer of an adrenal gland
4. Cushing syndrome, which can be caused by corticosteroid drugs
5. Congenital adrenal hyperplasia, disorder of the cortisol-secreting adrenal glands
6. Hyperthyroidism, or overactive thyroid gland
7. Hyperparathyroidism, which affects calcium and phosphorous levels
8. Pregnancy
9. Sleep apnea
10. Obesity
11. Chronic kidney disease (CKD) (Medical News Today, 2017a).

1.3.2.2 Risk factors of Hypertension

A number of risk factors increase the chances of having hypertension.

- Age

- Ethnicity

- Size and weight**.**

- Sex

Existing health conditions: Other contributing factors include:

1. physical inactivity

2. a salt-rich diet associated with processed and fatty foods

3. low potassium in the diet

4. alcohol and tobacco use

5. certain diseases and medications

6. A family history of high blood pressure and poorly managed stress also contribute (Medical News Today, 2017a).

1.3.2.3 Symptoms of Hypertension

A person with hypertension may not notice any symptoms, and it is often called the "silent killer." While undetected, it can cause damage to the cardiovascular system and internal organs, such as the kidneys (Medical News Today, 2017a).

Symptoms for Hypertension are following;

- Severe headache
- Fatigue or confusion
- Vision problems
- Chest pain
- Difficulty breathing
- Irregular heartbeat
- Blood in the urine
- Pounding in your chest, neck, or ears (WebMD, 2017).

1.3.2.4 Diagnosis of Hypertension

Diagnosis of hypertension is made by measuring blood pressure over at least 3 clinic visits using the upper-arm cuff device called a sphygmomanometer. The doctor will take a history and perform a physical examination before diagnosing hypertension. Some additional tests can help identify the cause of high blood pressure and determine any complications.

Tests may include:

1. urine tests
2. kidney ultrasound imaging
3. blood tests
4. electrocardiogram (ECG) and an echocardiograph

1.3.2.5 Treatment of Hypertension

Lifestyle choices can contribute to the treatment and prevention of high blood pressure, and they can have wider benefits for the heart and overall health.

Salt restriction

Average salt intake is between 9 grams (g) and 12 g a day in most countries around the world. The WHO recommend reducing intake to under 5 g a day, to help decrease the risk of hypertension and related health problems.

More fruit and vegetables, less fat

It is important to avoid trans-fats, or hydrogenated vegetable oils, and animal fats, where possible & following recommendation are preferred to avoid the risk of Hypertension.

Recommended instead are:

1. whole-grain, high-fibre foods

2. a variety of fruit and vegetables

3. beans, pulses, and nuts

4. omega-3-rich fish twice a week

5. non-tropical vegetable oils, for example, olive oil

6. skinless poultry and fish

7. low-fat dairy products

Reducing and maintaining weight

Hypertension is closely related to excess body weight, and weight reduction is normally followed by a fall in blood pressure. A healthy, balanced diet with a calorie intake that matches the individual's size, sex, and activity level will help.

Regular physical exercise

Doctors recommend that patients with hypertension engage in 30 minutes of moderate-intensity dynamic aerobic exercise, such as walking, jogging, cycling or swimming, on 5 to 7 days of the week.

Stress reduction

Avoiding stress, or developing strategies for managing unavoidable stress, can help with blood pressure control. Using alcohol, drugs, smoking, and unhealthy eating to cope with stress will add to hypertensive problems. These should be avoided. Smoking can raise blood pressure. Giving up smoking reduces the risk of hypertension, heart conditions, and other health issues.

Drug treatments for Hypertension

Drugs are usually started one at a time, at a low dose. Side effects associated with antihypertensive drugs are usually minor. Eventually, a combination of at least two antihypertensive drugs is usually required.

A range of drug types are available to help lower blood pressure, including:

1. diuretics, including thiazides, chlorthalidone, and indapamide

2. beta-blockers and alpha-blockers

3. calcium-channel blockers

4. central agonists

5. peripheral adrenergic inhibitor

6. vasodilators

7. angiotensin-converting enzyme (ACE) inhibitors

8. angiotensin receptor blockers

The choice of drug depends on the individual and any other conditions they may have (Medical News Today, 2017b).

1.3.3 Cancer

Cancer is caused by changes (mutations) to the DNA within cells. The DNA inside a cell is packaged into a large number of individual genes, each of which contains a set of instructions telling the cell what functions to perform, as well as how to grow and divide. Errors in the instructions can cause the cell to stop its normal function and may allow a cell to become cancerous (Mayo Clinic, 2015a).

1.3.3.1 Symptoms of Cancer

Signs and symptoms caused by cancer will vary depending on what part of the body is affected. Some general signs and symptoms associated with, but not specific to, cancer, include:

- Fatigue
- Lump or area of thickening that can be felt under the skin
- Weight changes, including unintended loss or gain
- Skin changes, such as yellowing, darkening or redness of the skin, sores that won't heal, or changes to existing moles
- Changes in bowel or bladder habits
- Persistent cough or trouble breathing
- Difficulty swallowing
- Hoarseness
- Persistent indigestion or discomfort after eating
- Persistent, unexplained muscle or joint pain
- Persistent, unexplained fevers or night sweats
- Unexplained bleeding or bruising (Mayo Clinic, 2015b).

1.3.3.2 Risk factors of Cancer

While doctors have an idea of what may increase risk of cancer, the majority of cancers occur in people who don't have any known risk factors. Factors known to increase risk of cancer include:

Age

Cancer can take decades to develop. That's why most people diagnosed with cancer are 65 or older. While it's more common in older adults, cancer isn't exclusively an adult disease. Cancer can be diagnosed at any age.

Habits

Certain lifestyle choices are known to increase risk of cancer. Smoking, drinking more than one alcoholic drink a day (for women of all ages and men older than age 65) or two drinks a day (for men age 65 and younger), excessive exposure to the sun or frequent blistering sunburns, being obese, and having unsafe sex can contribute to cancer. One can change these habits to lower risk of cancer — though some habits are easier to change than others.

Family history

Only a small portion of cancers are due to an inherited condition. If cancer is common in family, it's possible that mutations are being passed from one generation to the next. One might be a candidate for genetic testing to see whether he/she have inherited mutations that might increase risk of certain cancers. Keep in mind that having an inherited genetic mutation doesn't necessarily mean they all get cancer.

Health conditions

Some chronic health conditions, such as ulcerative colitis, can markedly increase risk of developing certain cancers. Consult with doctor about the risk.

Environment

The environment around may contain harmful chemicals that can increase risk of cancer. Even someone don't smoke, they might inhale secondhand smoke if someone go where people are smoking or if anyone live with someone who smokes. Chemicals in home or workplace, such as asbestos and benzene, also are associated with an increased risk of cancer. (Mayo Clinic, 2015c)

1.3.3.3 Treatments and drugs for Cancer

Many cancer treatments are available. Treatment options will depend on several factors, such as the type and stage of cancer, general health, and preferences. Together patient and doctor can weigh the benefits and risks of each cancer treatment to determine which is best for him/her.

Doctors have many tools when it comes to treating cancer. Cancer treatment options include:

- **Surgery:** The goal of surgery is to remove the cancer or as much of the cancer as possible.
- **Chemotherapy:** Chemotherapy uses drugs to kill cancer cells.
- **Radiation therapy:** Radiation therapy uses high-powered energy beams, such as X-rays, to kill cancer cells
- **Stem cell transplant:** Stem cell transplant is also known as bone marrow transplant. A stem cell transplant allows doctor to use higher doses of chemotherapy to treat cancer.
- **Immunotherapy:** Immunotherapy, also known as biological therapy, uses body's immune system to fight cancer.
- **Hormone therapy:** Examples include breast cancer and prostate cancer. Removing those hormones from the body or blocking their effects may cause the cancer cells to stop growing.
- **Targeted drug therapy:** Targeted drug treatment focuses on specific abnormalities within cancer cells that allow them to survive.
- **Clinical trials:** Clinical trials are studies to investigate new ways of treating cancer. Thousands of cancer clinical trials are underway.
- Other treatments may be available, depending on type of cancer (Mayo Clinic, 2015c).

1.3.4 Asthma

Asthma is a chronic lung disease that inflames and narrows the airways. Asthma causes recurring periods of wheezing (a whistling sound when someone breathe), chest tightness,

shortness of breath, and coughing. The coughing often occurs at night or early in the morning. Asthma affects people of all ages, but it most often starts during childhood (National Heart, Lung & Blood Institute, 2014a).

1.3.4.1 Causes of Asthma Attack

An overly sensitive immune system make airways (bronchial tubes) become inflamed and swollen when exposed to certain triggers. Asthma triggers vary from person to person. Common asthma attack triggers include:

- Pollen, pets, mold and dust mites
- Upper respiratory infections
- Tobacco smoke
- Inhaling cold, dry air
- Gastroesophageal reflux disease (GERD)
- Stress

For many people, asthma symptoms get worse with a respiratory infection such as a cold. Some people have asthma flare-ups caused by something in their work environment. Sometimes, asthma attacks occur with no apparent cause (Mayo clinic. 2017; National Heart, Lung & Blood Institute, 2014b).

1.3.4.2 Risk Factor Asthma Attack

Anyone who has asthma is at risk of an asthma attack. Asthma attack may be at increased risk of a serious asthma attack if:

- had a severe asthma attack in the past

- previously been admitted to the hospital or had to go to the emergency room for asthma

- required intubation for an asthma attack

- use more than two quick-acting (rescue) inhalers a month

- asthma attacks tend to sneak up before notice symptoms have worsened

- other chronic health conditions, such as sinusitis or nasal polyps, or cardiovascular or chronic lung disease (Mayo clinic, 2017; National Heart, Lung & Blood Institute, 2014c).

1.3.4.3 Signs and Symptoms of Asthma Attack

Common signs and symptoms of asthma include:

- Coughing: Coughing from asthma often is worse at night or early in the morning, making it hard to sleep.
- Wheezing: Wheezing is a whistling or squeaky sound that occurs when you breathe.
- Chest tightness: This may feel like something is squeezing or sitting on chest.
- Shortness of breath: Some people who have asthma say they can't catch their breath or they feel out of breath (National Heart, Lung & Blood Institute, 2014d).

1.3.4.4 Diagnosis of Asthma Attack

For adults and children over 5 years old, lung (pulmonary) function tests are used to check how well the lungs are working. Poor lung function is a sign that your asthma isn't well-controlled. In some cases, lung function tests are also used in asthma emergencies to help check the severity of an asthma attack or how well treatment is working.

Lung function tests include:

- **Peak flow:** The results of this test are known as peak expiratory flow (PEF). A peak flow test is done by blowing into a mouthpiece as hard and as fast as you can with a single breath (expiration).
- **Spirometry:** the results of this test are known as forced expiratory volume (FEV). Spirometry can also measure how much air lungs can hold and the rate at which one can inhale and exhale.
- **Nitric oxide measurement.** A newer diagnostic test, this exam measures the amount of nitric oxide gas you have in your breath when you exhale. High nitric oxide readings indicate inflammation of the bronchial tubes.

- **Pulse oximetry.** This test is used during a severe asthma attack. It measures the amount of oxygen in your blood. It's measured through your fingernail and only takes seconds (Mayo Clinic. 2017)

1.3.4.5 Treatment of Asthma attack

Long Term Control Medicine:

Corticosteroids: Inhaled corticosteroids are the preferred medicine for long-term control of asthma. Taken in pill form, these medications help to reduce lung inflammation and get asthma symptoms under control. Corticosteroids can also be given intravenously, typically to patients who are vomiting or under respiratory failure.

Other long-term control medicines include:

- **Cromolyn:** It helps prevent airway inflammation.
- **Omalizumab (anti-IgE):** It helps prevent your body from reacting to asthma triggers, such as pollen and dust mites.
- **Inhaled long-acting beta2-agonists:** These medicines open the airways. They might be added to inhale corticosteroids to improve asthma control.
- **Leukotriene modifiers:** These medicines are taken by mouth. They help block the chain reaction that increases inflammation in airways.
- **Theophylline:** This medicine is taken by mouth. Theophylline helps open the airways.

Quick-Relief Medicines

All people who have asthma need quick-relief medicines to help relieve asthma symptoms that may flare up. Inhaled short-acting beta2-agonists are the first choice for quick relief.

These medicines act quickly to relax tight muscles around airways when someone having a flare-up. This allows the airways to open up so air can flow through them (Mayo Clinic, 2017; National Heart, Lung & Blood Institute, 2014).

1.3.4.5 Prevention of Asthma Attack

Asthma can't be prevented. However, one can take steps to control the disease and prevent its symptoms. For example:

- Learn about asthma and ways to control it.
- Follow the written asthma action plan.
- Identify and try to avoid things that make asthma worse (asthma triggers). However, one trigger should not avoid is physical activity. Physical activity is an important part of a healthy lifestyle.
- Keep track of asthma symptoms and level of control.
- Get regular checkups for asthma (National Heart, Lung & Blood Institute, 2014f).

1.3.5 Hyperlipidemia

Hyperlipidemia means there is too much cholesterol in the blood. Cholesterol is a waxy, fat protein that is made by the liver. It is essential for healthy cell membranes, brain functioning, hormone production, and vitamin storage. Cholesterol becomes a problem when too much bad cholesterol, or low-density lipoprotein (LDL), is produced or ingested through unhealthy foods. Lipoproteins transport cholesterol through the blood to the cells. HDL is good because it carries extra cholesterol back to the liver where it can be eliminated. LDL is bad, because it enables excess cholesterol to build up in the blood (Medical News Today, 2017i).

1.3.5.1 Causes of Hyperlipidemia

The causes of hyperlipidemia can be due to:

- Genetic factors: This is primary hyperlipidemia. Familial hyperlipidemia stems from a genetic disorder.
- Poor diet and other factors: This is secondary hyperlipidemia

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

Other causes include:

- excessive alcohol consumption
- obesity
- use of medications such as hormones or steroids
- diabetes
- kidney disease
- underactive thyroid gland, or hypothyroidism
- pregnancy (Medical News Today, 2017c).

1.3.5.2 Signs and Symptoms of Hyperlipidemia

Unlike people with typical hyperlipidemia, people with familial combined hyperlipidemia may experience symptoms of cardiovascular disease after a few years, such as:

- chest pain (at a young age)

- heart attack (at a young age)

- cramping in the calves while walking

- sores on the toes that don't heal properly

- stroke symptoms, including trouble speaking, drooping on one side of the face, or weakness in the extremities (health line. 2017).

1.3.5.3 Risk Factor of Hyperlipidemia

LDL ("bad") cholesterol builds up in artery walls, making them hard and narrow. HDL ("good") cholesterol cleans up excess "bad" cholesterol and moves it away from the arteries, back to liver. Hyperlipidemia is caused by having too much LDL cholesterol in blood and not enough HDL cholesterol to clear it up.

Unhealthy lifestyle choices can raise "bad" cholesterol levels and lower "good" cholesterol levels. If someone are overweight, eating lots of fatty foods, smoking, or not getting enough exercise, then they are at risk.

Lifestyle choices that put you at risk for high cholesterol include:

- eating foods with saturated and trans fats

- eating animal protein, like meat and dairy

- not getting enough exercise

- not eating enough healthy fats

- obesity

- large waist circumference

- smoking

- drinking alcohol excessively

Abnormal cholesterol levels are also found in some people with certain health conditions, including:

- kidney disease

- diabetes

- polycystic ovary syndrome

- pregnancy

- underactive thyroid

- inherited conditions

As well, your cholesterol levels may be affected by certain medications:

- birth control pills

- diuretics

- some depression medications (health line. 2017).

1.3.5.4 Diagnosis of Hyperlipidemia

Hyperlipidemia has no symptoms, so the only way to detect it is to have your doctor perform a blood test called a lipid panel or a lipid profile. This test determines cholesterol levels. Doctors will take a sample of blood and send it to a lab for testing, then get back to with a full report. Report will show your levels of:

- total cholesterol
- low-density lipoprotein (LDL) cholesterol
- high-density lipoprotein (HDL) cholesterol
- triglycerides

Normal levels for a lipid profile are:

1. Total cholesterol: less than 200
2. LDL: less than 100
3. HDL: greater than 40 for men, greater than 50 for women (higher is even better)
4. Triglycerides: less than 140 (health line. 2017).

1.3.5.5 Treatment of Hyperlipidemia

Lifestyle options are the best way to prevent and treat hyperlipidemia. This involves a "heart healthy" diet, regular exercise habits, no smoking, and maintaining a healthy weight.

Medications

If lifestyle changes aren't enough to treat hyperlipidemia, your doctor may prescribe medication. Common cholesterol- and triglyceride-lowering medications include:

- Statins, such as:

    1. Atorvastatin (Lipitor)

    2. Fluvastatin (Lescol XL)

    3. Lovastatin (Altoprev)

    4. Pitavastatin (Livalo)

5. Pravastatin (Pravachol)

6. Rosuvastatin (Crestor)

7. Simvastatin (Zocor)

- Bile-acid-binding resins, such as:

  1. Cholestyramine (Prevalite)

  2. Colesevelam (WelChol)

  3. Colestipol (Colestid)

- Cholesterol absorption inhibitors, such as ezetimibe (Zetia)

- Injectable medications, such as alirocumab (Praluent) or evolocumab (Repatha)

- Fibrates, like fenofibrate (Fenoglide, Tricor, Triglide) or gemfibrozil (Lopid)

- Niacin (Niacor)

- Omega-3 fatty acid supplements

- Other cholesterol-lowing supplements (health line. 2017).

1.3.6 Overweight and obesity

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.

1.3.6.1 Body Mass Index (BMI)

BMI is a useful measure of overweight and obesity. It is calculated from height and weight. BMI is an estimate of body fat and a good gauge of risk for diseases that can occur with more body fat. The higher BMI, the higher risk for certain diseases such as heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers. Although BMI can be used for most men and women, it does have some limits:

- It may overestimate body fat in athletes and others who have a muscular build.
- It may underestimate body fat in older persons and others who have lost muscle (NIH, 2017).

Use the BMI Calculator or BMI Tables to estimate body fat. The BMI score means the following:

BODY MASS INDEX (BMI)	
CLASSIFICATION	BMI SCORE (kg/m2)
Underweight	< 18.5
Normal	18.5 - 24.9
Overweight	25.0 - 29.0
Obese	30.0 - 40.0
Extreme Obese	> 40.0

1.3.6.2 Waist Circumference

Waist circumference is another widely used measurement to determine abdominal fat content. An excess of abdominal fat, when out of proportion to total body fat, is considered a predictor of risk factors related to obesity. Men with a waist measurement exceeding 40 inches are considered at risk. Women are at risk with a waist measurement of 35 inches or greater (Obesity Society, 2016).

1.3.6.3 Causes of obesity and overweight

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been:
- An increased intake of energy-dense foods that are high in fat.
- An increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization.

1.3.6.4 Prevention of overweight and obesity

Overweight and obesity, as well as their related non communicable diseases, are largely preventable. Supportive environments and communities are fundamental in shaping people's choices, by making the choice of healthier foods and regular physical activity the easiest choice (the choice that is the most accessible, available and affordable), and therefore preventing overweight and obesity.

At the individual level, people can:
- limit energy intake from total fats and sugars;
- increase consumption of fruit and vegetables, as well as legumes, whole grains and nuts; and

- Engage in regular physical activity (60 minutes a day for children and 150 minutes spread through the week for adults) (World Health Organization, 2016).

1.4 Common Risk Factors of NCDs

Age: As the age increase, the chances of NCD's increasing accordingly.

Ethnicity: Some ethnic groups are more prone to NCD's.

Size and weight: Being overweight or obese is a key risk factor.

Sex: The lifetime risk is the same for males and females, but men are more prone to hypertension at a younger age, while rates tend to be higher rate in women at older ages.

Existing health conditions: Cardiovascular disease, chronic kidney disease, and high cholesterol levels are predictors for hypertension, especially as people get older.

Family history: Most of the NCDs are due to family related. Diabetes asthma are mostly happen due to any of the family member contain those specific type of gene, which are responsible for diabetes asthma etc (Medical News Today, 2017h).

1.5 The Financial Burden of NCDs

The financial and social burden of NCDs is immense, and the financial investment to alleviate this burden on patients, families and careers is comparatively small. WHO's 'Best Buys' offer options that provide not only financial return on investment, but also health and social benefits.

A 2011 economic evolution report prepared by the World Economic Forum and the Harvard School of Public Health, in advance of the 2011 UN Summit on NCDs identified 5 key points around the financial burden of 5 major NCDs (cardiovascular disease, chronic respiratory disease, cancer, diabetes, and mental illness).

1. These 5 NCDs could contribute a cumulative output loss of US$ 47 trillion in the two decades from 2011, representing a loss of 75% of global GDP in 2010 (US$ 63 trillion).

2. As economies, ages and populations in low and middle income countries grow, they are likely to overtake high income countries in terms of growth in the burden of NCDs.

3. Cardiovascular disease and mental health conditions contribute the greatest economic burden of NCDs.

4. Business leaders throughout the world are concerned about the impact of NCDs, more-so than concerns about communicable diseases. Where quality of or access to healthcare is considered poor, concern is greater.

5. There are options available to prevent and control NCDs, such as WHO's "Best Buys", behaviour change interventions, and more cost-effective models of care which also alleviate the burden on family-carers (NCD Alliance, 2017a).

1.6 NCD's & Sustainable Human Development

The global epidemic of NCDs is widely acknowledged as a major development challenge in the 21st century, and a significant threat to achieving internationally agreed development goals. In addition to being the leading causes of death, NCDs impose years of disability on those affected and their families. NCDs and the three pillars of sustainable development.

Improving the health of populations, including preventing and controlling NCDs, is integral to ensuring progress across the three pillars of economic growth, social equity, and environmental protection—with the ultimate goal of achieving sustainable development.

Numerous UN declarations, resolutions, and international agreements demonstrate that governments recognize the interconnections between health, NCDs, and sustainable development.

The 2002 Johannesburg Declaration on Sustainable Development indicates early recognition of this relationship, and more recently, the 2012 UN Political Declaration on the Prevention and Control of NCDs acknowledges that the global burden of NCDs

"undermines social and economic development throughout the world." Despite political recognition, however, the global response to the NCD epidemic has been slow, and the epidemic continues to grow, hindering progress on sustainable development.

The impact of the NCD epidemic on economic growth indicates that health is an important factor in economic development and affirms a more holistic approach to development. National, regional, and global wellbeing increasingly depends on a development process that values healthy social and environmental systems along with economic growth in the drive to achieve sustainable development (NCD Alliance, 2017b).

1.7 Worldwide Condition of NCD's

Of the 57 million global deaths in 2008, 36 million, or 63%, were due to noncommunicable diseases. The four main NCD are cardiovascular diseases, cancers, diabetes and chronic lung diseases. The burden of these diseases is rising disproportionately among lower income countries and populations. In 2008, nearly 80% of noncommunicable disease deaths -- 29 million -- occurred in low- and middle-income countries.

The leading causes of NCD deaths in 2008 were cardiovascular diseases (17 million deaths, or 48% of all NCD deaths), cancers (7.6 million, or 21% of all NCD deaths), and respiratory diseases, including asthma and chronic obstructive pulmonary disease (4.2 million). Diabetes caused another 1.3 million deaths.

Across the WHO Regions, with the exception of the African region, deaths from noncommunicable diseases exceeded those from communicable, maternal, perinatal and nutritional conditions combined. For men in the WHO European Region, deaths from noncommunicable diseases were 13 times higher than these other causes combined, and for men in the WHO Western Pacific region, they were 8 times higher.

The overall noncommunicable diseases age-standardized death rates for all ages in low- and middle-income countries were 756 per 100,000 for males and 565 per 100,000 for females - 65% and 85% higher respectively than for males and females in high income countries in 2008. Age-standardized male noncommunicable diseases mortality rates for

all ages were highest in the African region for males (844 per 100,000) and for females (724 per 100,000) (WHO, 2017).

1.8 Current NCD Condition in Bangladesh

Bangladesh, like many transitional nations, is straddling the demographic and epidemiological transition. In a review of twenty-three developing countries, Bangladesh was found to have the ninth highest rate of age-standardized mortality among the included countries due to chronic diseases, primarily cardiovascular diseases and diabetes.

Some 51% of deaths in Bangladesh are due to non-communicable diseases and other chronic health conditions .There is no free or subsidized treatment for non-communicable diseases through the public health system in Bangladesh in which no cost the point of service and incentivized programmes exist for some communicable diseases and maternal and child health. Swedish International Development Cooperation Agency reports that there is an increasing demand for care for diabetes, heart disease and stress .The means for prevention are established, and should be integrated within the public health system.

1.8.1 Disease burden and risk factors Bangladesh

- Tobacco use: more prevalent among the poorest men (70%) Hypertension: no representative studies have been conducted, but small scale studies indicate high prevalence.
- Cardiovascular diseases: indicated to be the main cause of death in 2005 (25.1%)
- Diabetes: Prevalence of 6.9%, with urban areas having a vastly higher prevalence. Bangladesh among top 10 countries with highest prevalence by 2025.

1.8.2 Country activities to address NCDs

- Launch of the Strategic Plan for Surveillance and Prevention of Non-Communicable Bangladesh, 2007-2010.
- Bangladesh was the first nation to ratify the WHO Framework Convention on Tobacco Control in 14 June 2004 and in March 2005 enacted Smoking and Tobacco Product Usage (Control) Act 2005.

- Multiple specialty hospitals and foundations exist and some have outreach activities (i.e., Diabetes Associations of Bangladesh, National Heart Foundation)

- BIRDEM academy established to provide adequate qualified manpower on diabetes and other endocrine related diseases (icddr,b, 2010).

Chapter two

Literature Review

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

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 (Wahid, 2015).

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

This study assessed the relationship between three chronic NCDs and socioeconomic status (SES) among the Bangladeshi population, paying particular attention to the differences between urban and rural areas. Data from the 2011 Bangladesh Demographic and Health Survey were used for this study. Using a concentration index (CI), we measured relative inequality across pre-diabetes, diabetes, pre-hypertension, hypertension, and BMI (underweight, normal weight, and overweight/obese) in urban and rural areas in Bangladesh. A CI and its associated curve can be used to identify whether socioeconomic inequality exists

for a given health variable. In addition, we estimated the health achievement index, integrating mean coverage and the distribution of coverage by rural and urban populations. Socioeconomic inequalities were observed across diseases and risk factors. Using CI, significant inequalities observed for pre-hypertension (CI = 0.09, p = 0.001), hypertension (CI = 0.10, p = 0.001), pre-diabetes (CI = -0.01, p = 0.005), diabetes (CI = 0.19, p<0.001), and overweight/obesity (CI = 0.45, p<0.001). In contrast to the high prevalence of the chronic health conditions among the urban richest, a significant difference in CI was observed for pre-hypertension (CI = -0.20, p = 0.001), hypertension (CI = -0.20, p = 0.005), pre-diabetes (CI = -0.15, p = 0.005), diabetes (CI = -0.26, p = 0.004) and overweight/obesity (CI = 0.25, p = 0.004) were observed more among the low wealth quintiles of rural population. In the same vein, the poorest rural households had more co-morbidities compared to the richest rural households (p = 0.003), and prevalence of co-morbidities was much higher for the richest urban households compared to the poorest urban households. On the other hand in rural the "disachievement" of health indicators is more noticeable than the urban ones. The findings indicate the high burden of selected NCDs among the low wealth quintile populations in rural areas and wealthy populations in urban areas. Particular attentions may be necessary to address the problem of NCDs among these groups (Rawal, 2016).

Prevalence of risk factors of non-communicable diseases in a rural area of Bangladesh

The aim of the study was to determine distribution and prevalence of risk factors of NCDs in a rural adult population of Bangladesh. A cross-sectional study targeting one adult (15 years or older) from each of 1088 households of a village was carried out in 2008. Among them 1011 participated. Information on age and education of the respondents and risk factors such as tobacco, fruit and vegetable intake, habit of added salt while taking the meal, blood pressure and waist circumference were obtained using standardized protocol. Mean age of the subjects was 42.4 years. Age adjusted prevalence of tobacco consumption was 59.5% (smoking 31.0% and smokeless tobacco use 36.3%). More than nine in ten (92.8%) of the respondents consumed less than 5 serving of fruit and/or vegetables per day. Nine in ten (88.5%) used extra salt during meal. Prevalence of hypertension and central obesity was

found 19.7% and 18.8% respectively. NCD risk factors are widely prevalent even in this rural population having a traditional agricultural lifestyle. Interventions those are appropriate to this kind of community are needed to be developed in Bangladesh (Ahmed, 2017).

Noncommunicable Disease Prevention and Control Situation in a Primary Health Care Setting of Bangladesh: Design and Baseline Findings of an Intervention

Current paper presents the initial finding of the assessment of capacity of PHC system in dealing with NCD prevention and control through a basic minimum intervention in an Upazila of Bangladesh. The assessment of the capacity of PHC was done in Debhata upazila of Satkhira district using interviews, record reviews and observations using check lists and questionnaires. A basic minimum intervention was done to see its appropriateness in a view to detect, prevent and manage NCDs, and to generate evidence to substantiate control measures. The intervention included such components as (a) strengthening health system through training and supply of equipment and medicines; (b) promoting medical information system and evidence generation, and (c) creation of public awareness through observance of NCD related days and campaigns. Doctors, nurses, technologists and filed level workers were present as per approved post and providing services. Relevant medicines, as per WHO essential drug list, were either supplied inadequate quantities or not supplied at all. Newly established NCD corner was not able to function adequately. The attendance of patients with NCDs was also poor (only 427 patients in 2013). Detection and referral of cases from field by the health workers were absent. Training of people and supply of essential equipment/logistics have improved functions substantially. With a short training and provision of equipment, health assistants could conducts NCD risk factor survey with satisfactory quality. Relevant backbone for NCD prevention and control is already existent at PHC level. Strengthening skills of personnel and provision of essential medicines and technologies can improve capacity of PHC system to deal with NCDs (Zaman, 2016).

Noncommunicable diseases: risk factors and regional strategies for prevention and care.

Noncommunicable diseases (NCDs) are a major disease burden in the Region. Many of the risk factors are related to lifestyle and can be controlled. Physical inactivity, low fruit and vegetable intake, high fast food consumption and high cholesterol are predominant causes of cardiovascular disease and some cancers. Overweight and obesity can lead to metabolic changes and raise the risk of NCDs, including heart disease and type 2 diabetes. Three main strategies are proposed to deal with the problem: estimate need and advocate for action; develop national policies, strategies and plans for prevention and care; promote and implement community participation in prevention and care. NCDs are preventable using available knowledge; solutions are effective and highly cost-effective (Khatib, 2004).

Prevalence of Risk Factors for Non-Communicable Diseases in Bangladesh: Results from STEPS Survey 2010

This study was done to determine the prevalence of common risk factors for major NCDs among men and women of rural and urban areas of Bangladesh. This survey was done with 9,275 individuals aged 25 years or older randomly drawn from all over the country. Information on diet, physical activity, tobacco and alcohol, and treatment history for hypertension and diabetes were collected. Height, weight, waist circumference, and blood pressure (BP) were measured. There were 4,312 men and 4,963 women with the mean age of 42 years (standard deviation 13 years). Half of them (54%) used tobacco in some form, <1% consumed alcohol within the past 30 days, 92% did not consume adequate fruit and vegetables (five servings or more), and 35% had low physical activity level [<600 metabolic equivalent (MET) min per week]. Documented diabetes was found in 4% of the participants. Seventeen percent were overweight [body mass index (BMI) $\geq$25 kg/m2] and 21% had abdominal obesity (men $\geq$94, women $\geq$80 cm). Overall, 21% people had hypertension (blood pressure $\geq$140/90 mmHg or medication). Physical inactivity, alcohol intake, hypertension, obesity, and diabetes were more prevalent in urban areas, as opposed to tobacco. Tobacco intake showed a decreasing gradient, but hypertension, obesity, diabetes, and low physical activity showed an increasing gradient across the wealth quartiles. Risk factors are widely prevalent in Bangladeshi people across sexes and across both rural and urban areas of

residences. NCD prevention through risk factor control, and early detection and treatment of hypertension and diabetes are warranted (Jalil, 2016).

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, 2014).

Research Priorities for Prevention and Control of Noncommunicable Diseases in India

India is undergoing a demographic and epidemiological transition which is influencing its health. Noncommunicable diseases (NCDs) are posing major health and development threats, while we are grappling with communicable diseases and maternal and child health-related issues. The major NCDs include cardiovascular diseases (including stroke), diabetes, cancer, chronic obstructive pulmonary diseases, mental health, and injuries. Tobacco, alcohol, diet,

physical inactivity, high blood pressure, and obesity are the major risk factors common to many chronic diseases. Research on NCDs under the ICMR and through other institutions has resulted in the initiation of some national health programs such as National Cancer Control Program and District Mental Health Program. Important epidemiological descriptions have informed us on the causes and distribution of NCDs and their risk factors, including the non-health determinants (poverty, education, employment, etc) and health systems assessments, have shown the inadequacies in tackling NCDs. Several global efforts and publications have provided guidance in shaping the research agenda. The special UN NCD Summit held on 19-20 September 2011 brought the world leaders to deliberate on ways to address NCDs in a concerted manner through partnerships. In this paper the authors review the present status of NCDs and their risk factors in the country and propose a strategic research agenda to provide adequate thrust to accelerate research towards a useful outcome (Shah, 2011).

Profile of Risk Factors for Non-Communicable Diseases in Punjab, Northern India: Results of a State-Wide STEPS Survey

Efforts to assess the burden of non-communicable diseases risk factors has improved in low and middle-income countries after political declaration of UN High Level Meeting on NCDs. However, lack of reliable estimates of risk factors distribution are leading to delay in implementation of evidence based interventions in states of India. A STEPS Survey, comprising all the three steps for assessment of risk factors of NCDs, was conducted in Punjab state during 2014–15. A statewide multistage sample of 5,127 residents, aged 18–69 years, was taken. STEPS questionnaire version 3.1 was used to collect information on behavioral risk factors, followed by physical measurements and blood and urine sampling for biochemical profile. Tobacco and alcohol consumption were observed in 11.3% (20% men and 0.9% women) and 15% (27% men and 0.3% women) of the population, respectively. Low levels of physical activity were recorded among 31% (95% CI: 26.7–35.5) of the participants. The prevalence of overweight and obesity was 28.6% (95% CI: 26.3–30.9) and 12.8% (95% CI: 11.2–14.4) respectively. Central obesity was higher among women (69.3%, 95% CI: 66.5–72.0) than men (49.5%, 95% CI: 45.3–53.7). Prevalence of hypertension in

population was 40.1% (95% CI: 37.3–43.0). The mean sodium intake in grams per day for the population was 7.4 gms (95% CI: 7.2–7.7). The prevalence of diabetes (hyperglycemia), hypertriglyceridemia and hypercholesterolemia was 14.3% (95% CI: 11.7–16.8), 21.6% (95% CI: 18.5–25.1) and 16.1% (95% CI: 13.1–19.2), respectively. In addition, 7% of the population aged 40–69 years had a cardiovascular risk of ≥ 30% over a period of next 10 years. We report high prevalence of risk factors of chronic non-communicable diseases among adults in Punjab. There is an urgent need to implement population, individual and programme wide prevention and control interventions to lower the serious consequences of NCDs (Pal, 2016).

Significant of the Study

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. A recent study by Ministry of health and family welfare Govt of Bangladesh shows that the burden of NCDs now surpasses infectious diseases in the country and 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. The Bangladesh NCD risk factor survey 2010 showed that 63% of all adult deaths because of NCD's. (Islam, et al 2014; BIRDEM Medical Journal, 2015). Risk factor of NCD can be controlled. There are two types of risk factor for non-communicable disease, one is modifiable and other is non-modifiable risk factors. The risk factors of non-communicable disease can be possible to reduce if any person wants. A few studies have been conducted in Bangladesh that showed half of the respondents consume both tobacco & maximum population consume less than 5 serving of fruit and/or vegetables per day (Ahmed, 2017; Jalil, 2016). Another study conducted in rural area, where the prevalence of hypertension & obesity was in severe condition (Ahmed, 2017; Jalil, 2016).

The study is designed in order to determine the prevalence, knowledge, awareness of the people regarding the NCD's. It is also done to see the clustering of NCD risk factor regarding as a thorough a several study done in Bangladesh on this topic to measure the biological and behavioral risk factors of people on non-communicable disease but comparison with two different population lives in different part of Bangladesh is rare. The significance of our study is that it will provide an idea about the distribution of the risk factors such as tobacco use, fruit and vegetables intake, physical activity, dietary habit, obesity, hypertension, family history of any NCDs, any current medical conditions of NCDs & a comparative study between urban & rural population to find out which population are in severe condition in 2017. From that we could also develop strategies to reduce the possible risk factors and to increase awareness among the people about NCDs.

Aims and Objective of the Study

The main objectives of the study are –

- To determine prevalence & estimation of NCD's of various years in our study area.
- To determine the knowledge and awareness regarding the Risk factors.
- To determine the comparison between rural & urban population & to detect which population are most prone to have NCDs.

Chapter three
Methodology

3.1 Type of the Study

It was a survey based cross sectional study.

3.2 Study Area

The survey was conducted in two different areas inside Thakurgaon as rural area & Dhaka & cox's Bazar as urban area.

3.3 Study Population

In this study, a total number of 270 respondents were surveyed with a questionnaire.

3.4 Inclusion Criteria

- Adult respondents (age ≥18)
- Both Male and Female respondents

3.5 Exclusion Criteria

- Unwilling person

3.6 Questionnaire Development

The questionnaire was specially designed to collect the simple background data and the needed information. The questionnaire was written in simple English in order to avoid unnecessary semantic misunderstanding & to avoid misunderstanding we ask the question by our own instead of supplying the questionnaire.

3.7 Sampling Technique

In this study convenience sampling technique was followed.

3.8 Data Collection

The data was collected through using the developed questionnaire by face to face interview.

3.9 Data Analysis

After collecting, the data were checked and analyzed with the help of Microsoft Excel 2010. The result was shown in bar, pie and column chart and calculated the percentage of the awareness and disease.

Chapter four

Results

4.1 Age distribution of the respondent

During this study it was found that about 29.63% population were in between 18 to 30 years, whereas, 24.44% were within the range of 31 to 40 years. However, only 10.37% population were in between 51 to 60 years of age. Around 28.89% population were within 41 to 50 years range and rest of the population which includes 6.67% were above 60 years of age. It was found that maximum population in rural area were within 18-30 years of age & in urban area it was within the range of 31-40 years of age.
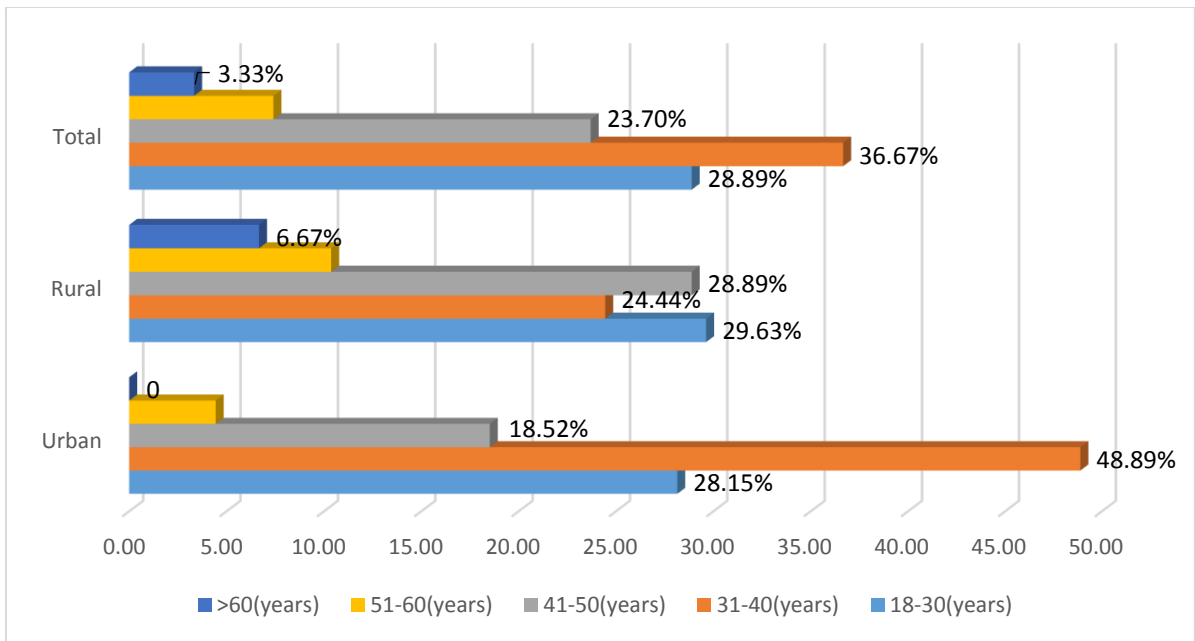
Figure 4.1: Age distribution of the respondent

4.2 Gender of the respondents

In this study, 41.85% respondents were female and rest of the population which includes 58.15% were male respondents.
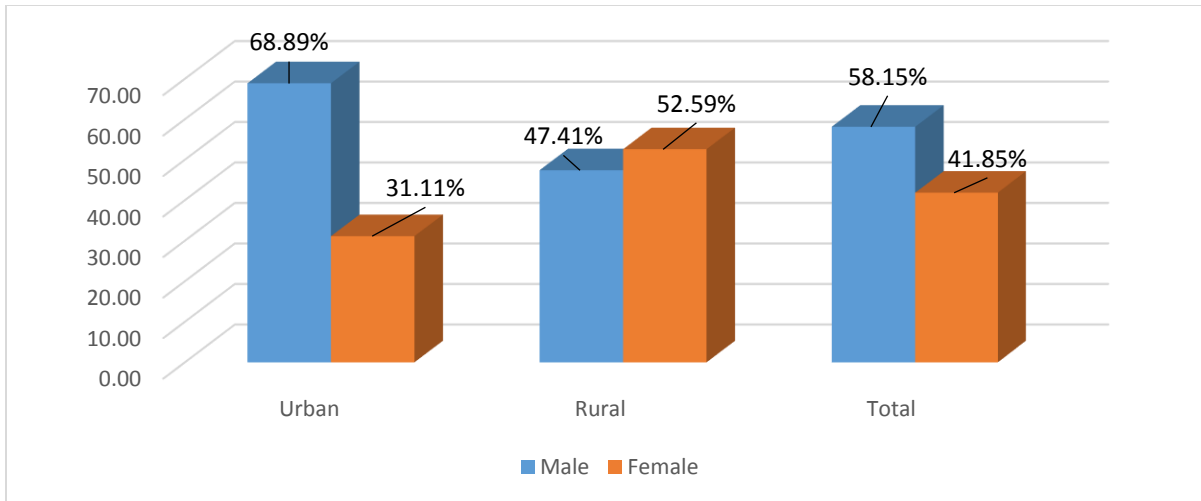
Figure 4.2: Gender of the respondents

4.3 Educational qualifications among respondents

Regarding their educational status about 11.85% of the population passed primary level, whereas, 7.78% were illiterate. Around 11.11% population were passed SSC level and 26.67% population were passed HSC level. This study found that 25.56% people were graduate and no person were post graduate. Only few people (17.04%) were in diploma level. Here in urban area most of the people are graduate whereas in rural area most of the people were HSC passed.
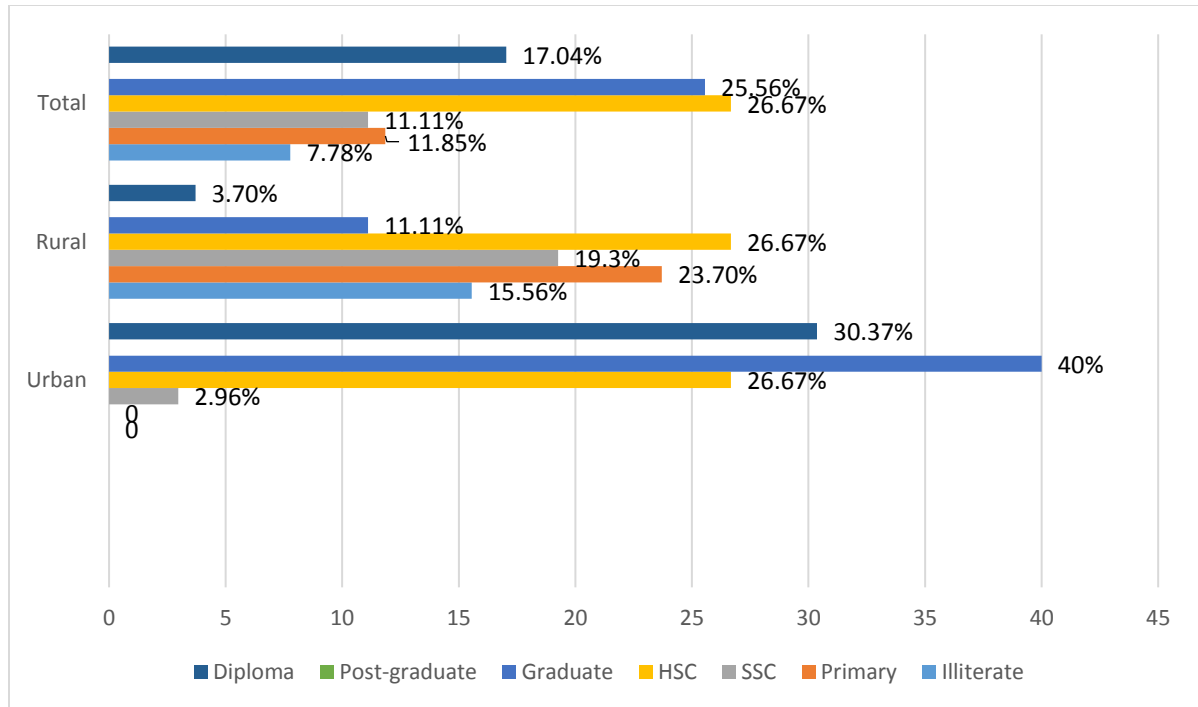
Figure 4.3: Educational qualifications among respondents

4.4 Occupational Qualifications of the Respondents

Throughout this study it was found that 17.78% among the respondents were housewife, whereas, 5.93% were student. Around 14.44% are working in the private sectors and 28.52% are the GOVT. service holders. Among the respondents 13.33% were businessmen and no one were unemployed. The rest of the population which includes 4.07% were retired and 15.56% population were farmer. After conducting this study it was found that in urban area most of the population were government service holder & in rural area it was farmer.
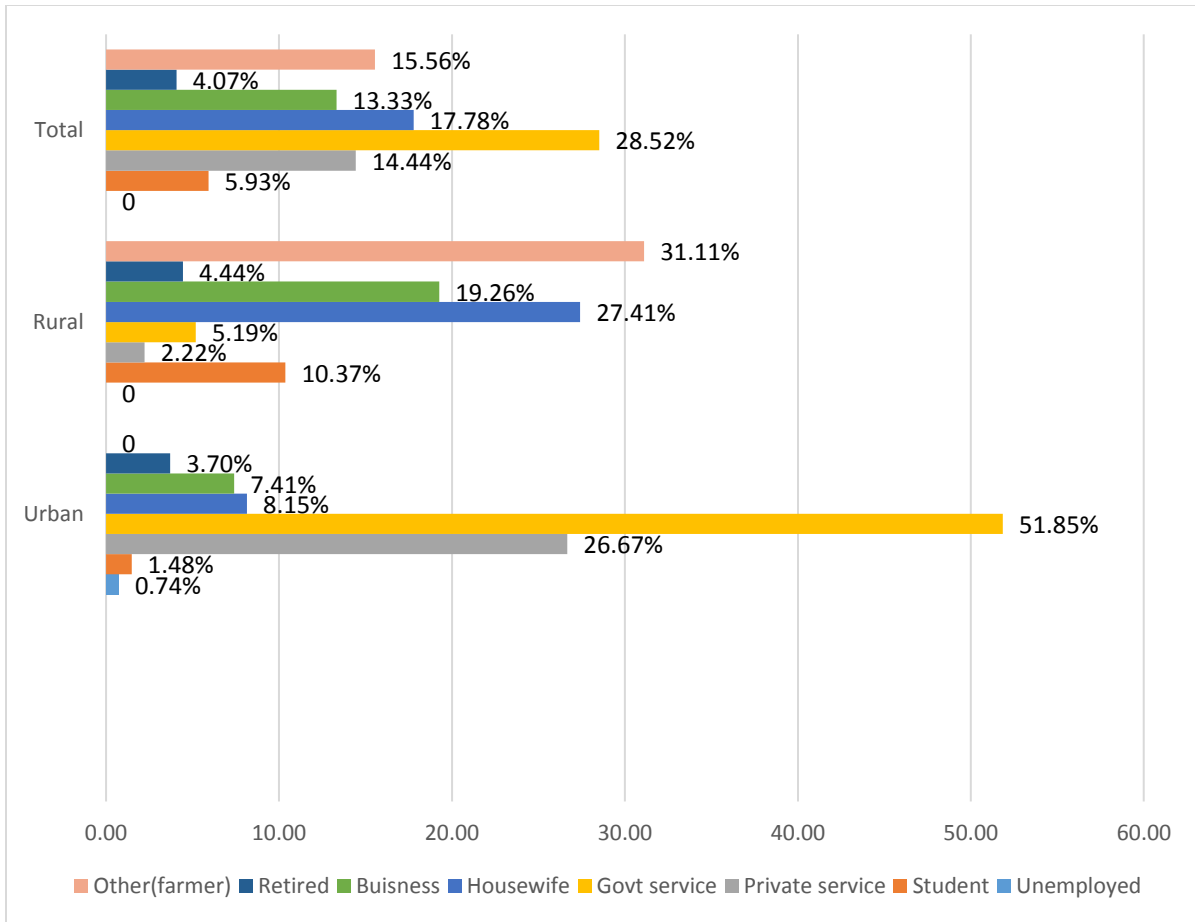
Figure 4.4: Occupational Qualifications of the Respondents

4.5 Marital status of the respondents

Among the respondents among 89.63% of the population were married upon which the study was conducted, whereas, 10.37% were unmarried.
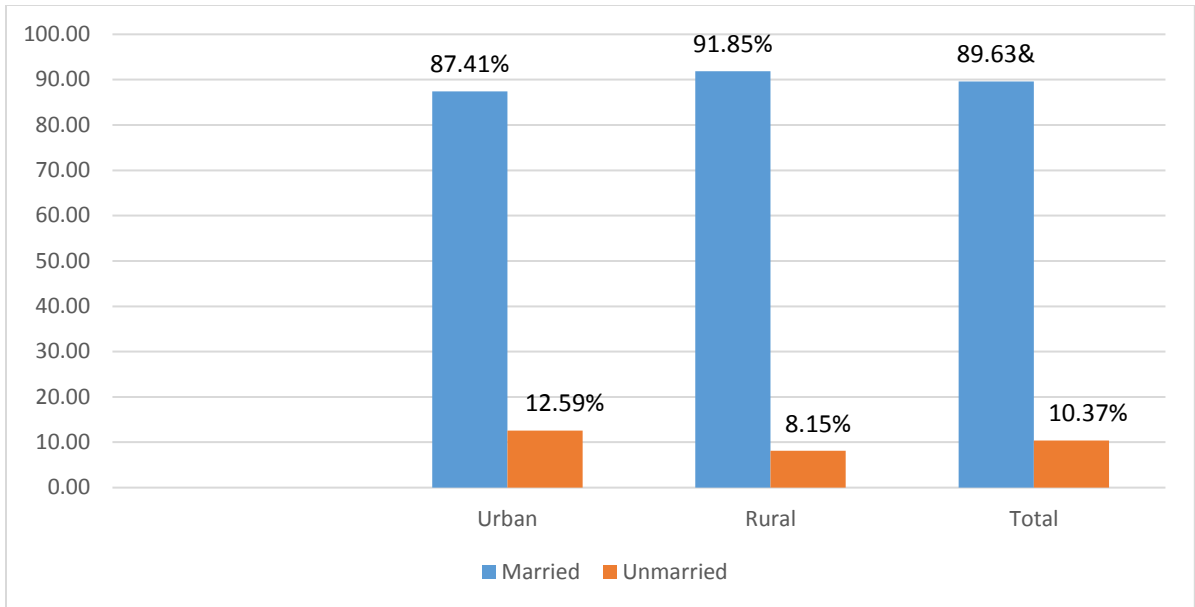
Figure 4.5: Marital status of the respondents

4.6 Monthly Family Income of the respondents

This study found that around 20.74% population had monthly family income 10000-20000tk, whereas, 21.11% had earnings of 20000-30000tk. Around 24.81% population had >30000tk monthly income and rest of the population which includes 33.33% had <10000tk as their monthly income. After the study it was found most of the population lives in rural areas had lower income in comparison with urban population.
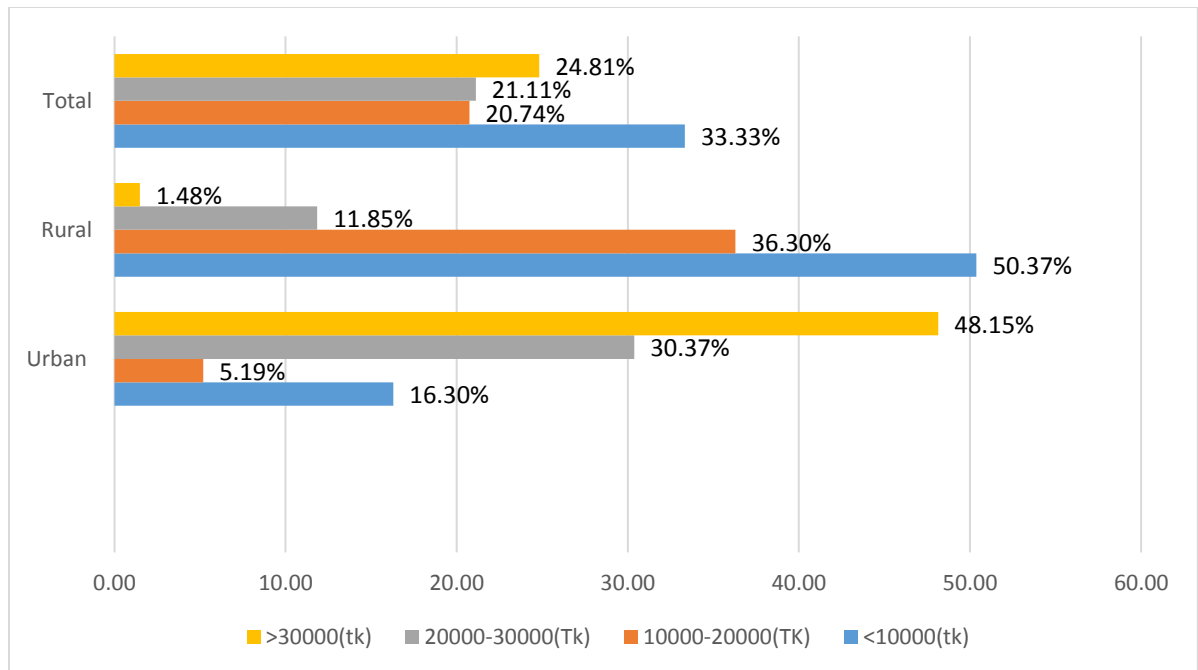
Figure 4.6: Monthly Family Income of the respondents

4.7 BMI (Body Mass Index) Status of the Respondents

Height, Weight and Waist circumference of each of the respondents were taken properly and it was then calculated with the BMI Calculator to signify the obesity in the studied population. From the results, we can see that 51.85% of the population had a normal weight whereas 2.59% of the population were underweight. But it was found that 40.74% of the population were within the range of overweight and had greater risk of obesity in the near future. On the other hand 4.81% of the population were already in the range of obesity so they were in greater risk of suffering from different kinds of non-communicable diseases. Here in this study, maximum portion of the population in urban areas were overweight whereas it was normal in rural area.
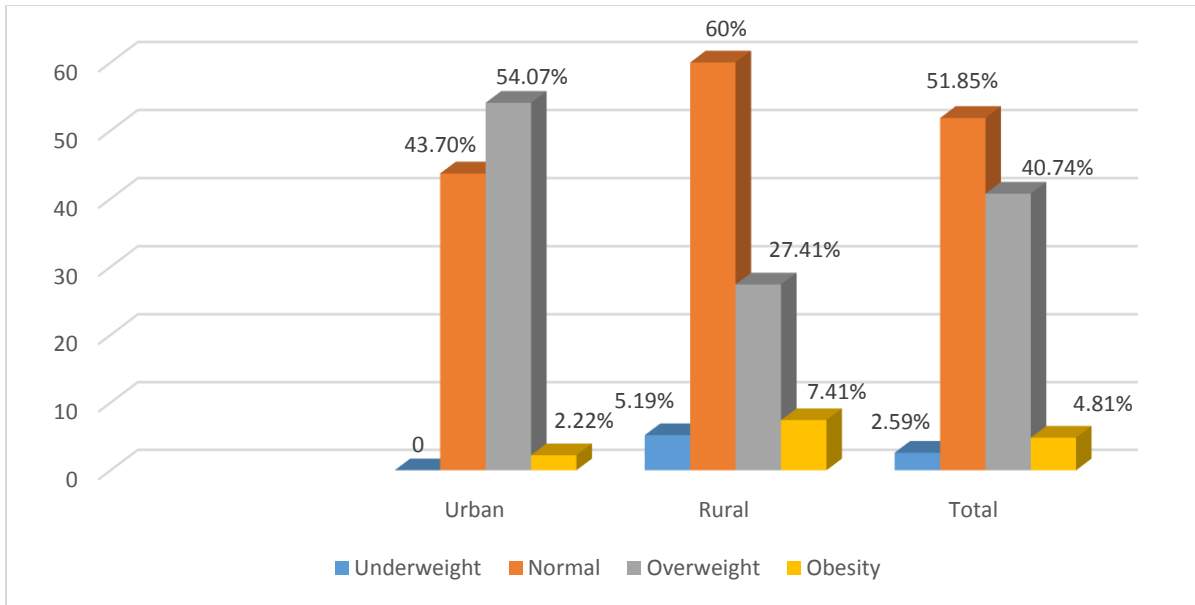
Figure 4.7: BMI (Body Mass Index) Status of the Respondents

4.8 Sleeping habits of respondents

Normally a healthy person needs 7-10 hours of sleep. In our study among 135 respondents we have found that 50% population has normal sleeping habit. The person with 0-6 hours' sleep is not sufficient which includes 50% of the people which means those people are sufficiently physically active but they have a high risk of non-communicable disease.
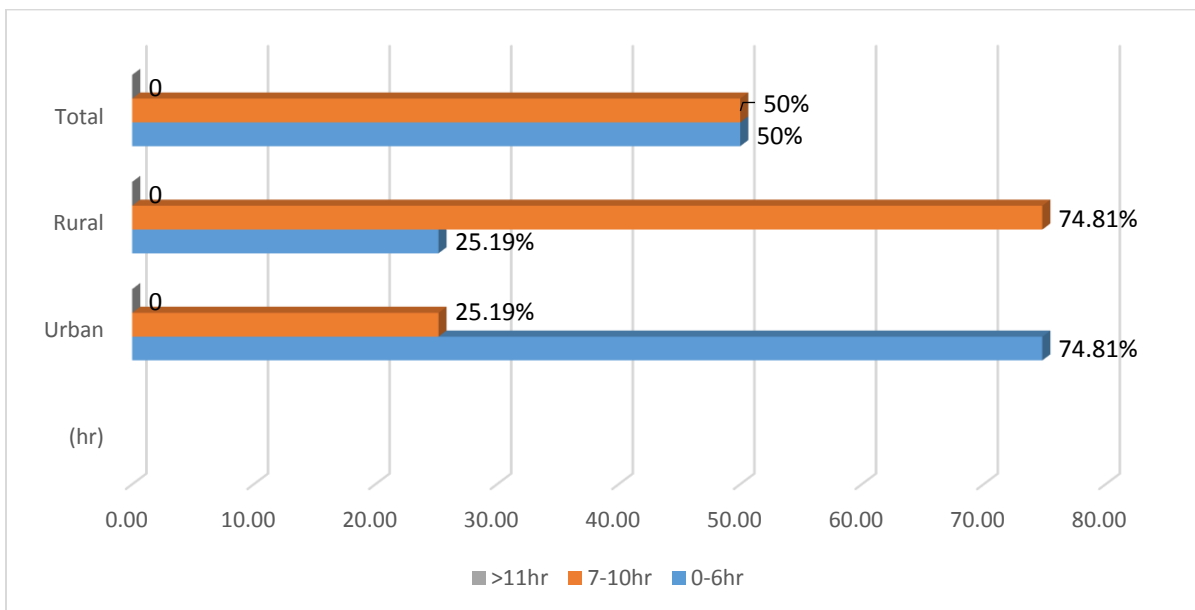

Figure 4.8: Sleeping habits of respondents

4.9 Blood Pressure Status of the Respondents

Blood pressure played an important role in the study and when we took the blood pressure of the respondents made sure that they are in the resting condition and we took blood pressure two times with 10 minutes differences. During this, when the pressure of each of the respondents were measured it was seen through analysis that none of the respondent had hypotension and 24.44% of the people had normal blood pressure conditions. But the major concerning issue was that 56.67% of the people having pre hypertension and rest of the population had 17.04% stage 1 hypertension which may lead to further complications. Around 1.85% population were in the stage 2 of hypertension crisis that may lead to serious health damage.
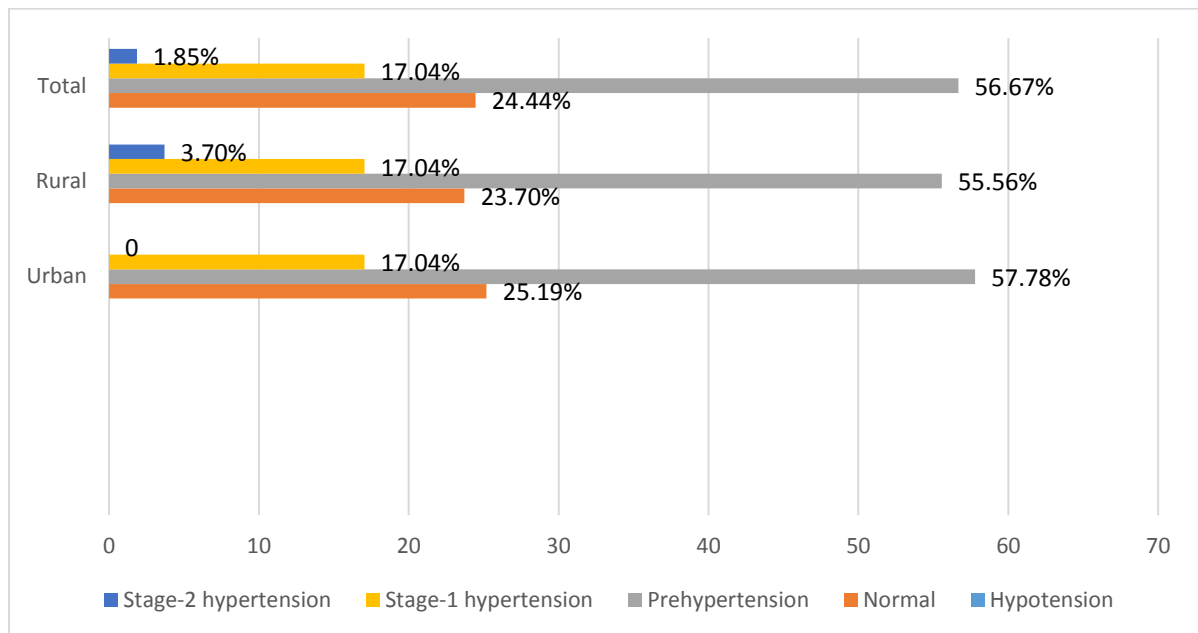

Figure 4.9: Blood Pressure Status of the Respondents

4.10 Current Medical Condition of the Respondents

When the respondents were asked whether they are suffering from any of the medical conditions than 34.81% of the people answered that they are suffering from hypertension. Other respondents included 12.22% from asthma, 17.04% from Diabetes Mellitus, 1.85% from hyperlipidemia, 6.30% from cardiovascular diseases and none of them having cancer. But 54.44% of the populations were not suffering from any of the conditions out of 147

respondents. Major population in urban area were suffer from hypertension but in urban area most of the population were not having any kind of current medical condition.
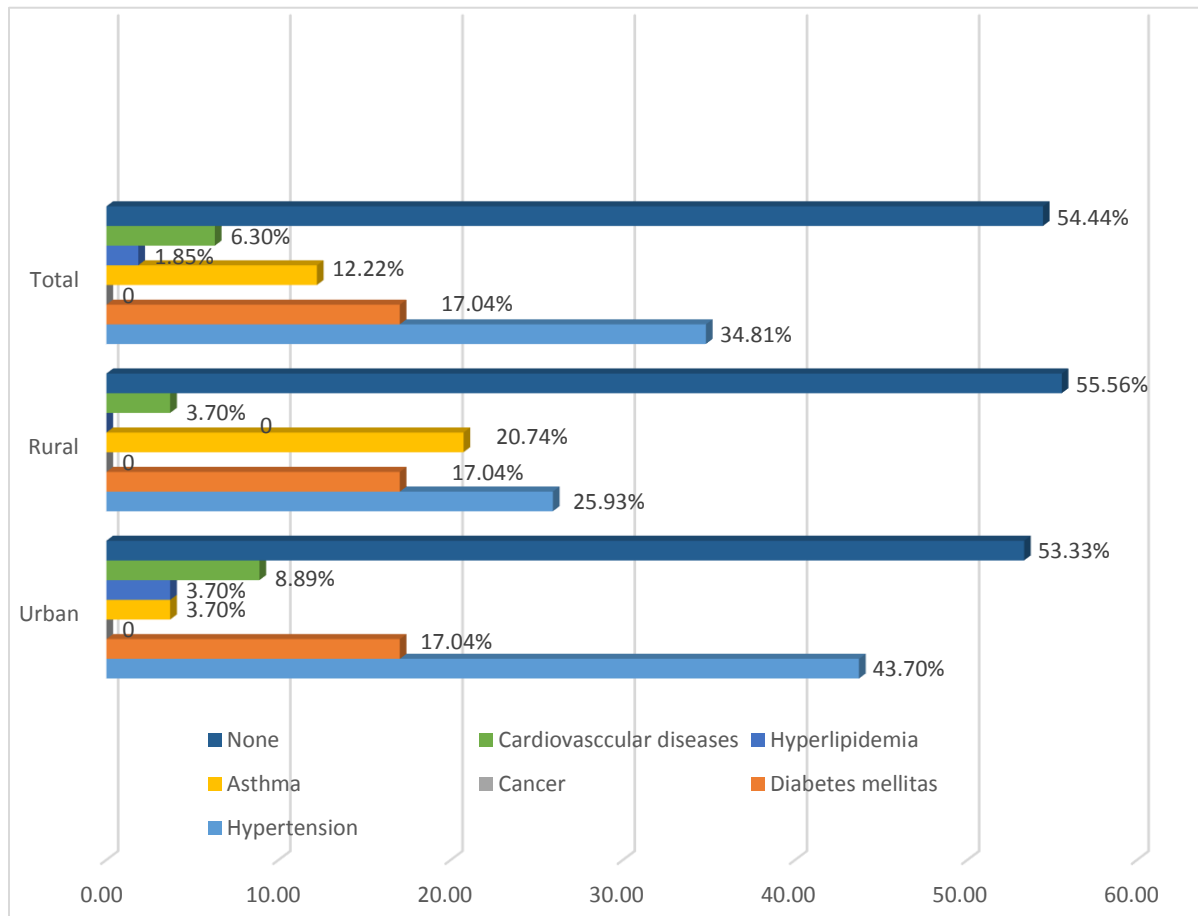

Figure 4.10: Current Medical Condition of the Respondents

4.11 Status of Respondents about suffering from any conditions

When the respondents were asked whether they are suffering from any of the medical conditions than 11.11% answered that they are sometimes suffer from angina. 2.96% people suffered from stroke and none of them having heart attack. But 85.93% people are not suffering in any of these following conditions.
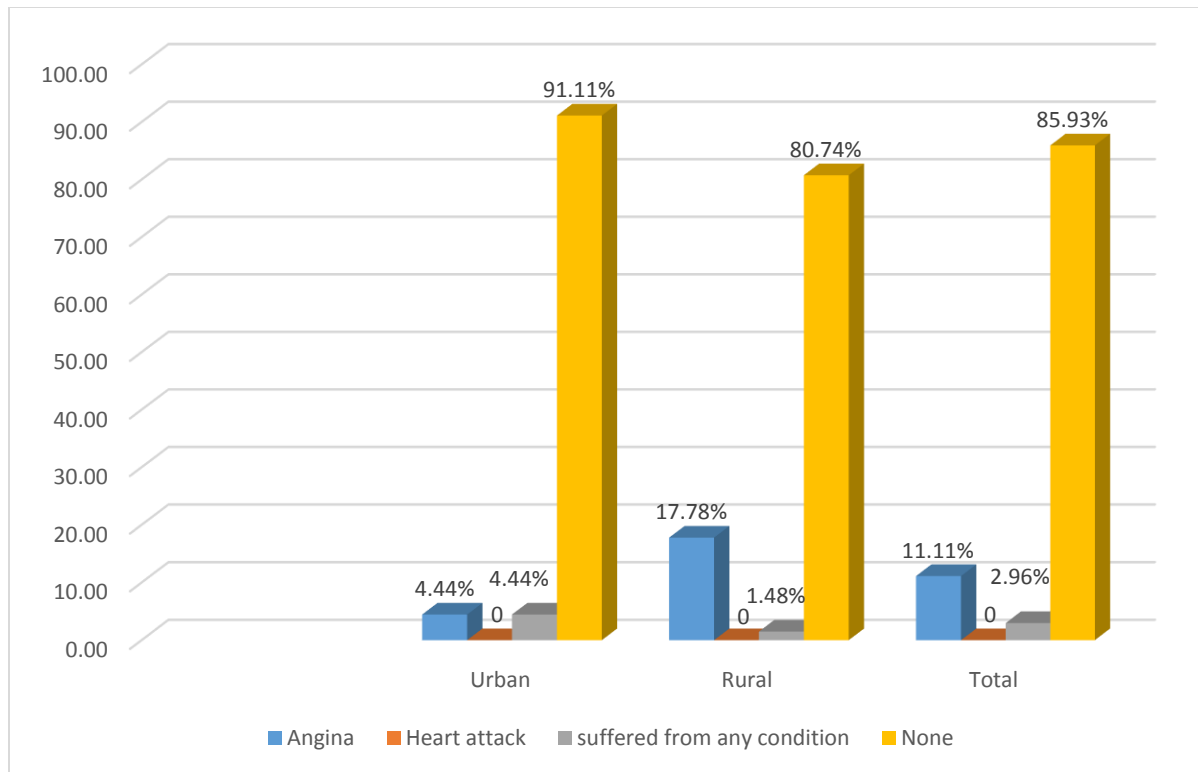
Figure 4.11: Status of Respondents

4.12 Family history of respondents risk factor

Every year 2.5 lakh Bangladeshis die due to tobacco and the rate of death is 28 per hour, according to a report of World Health Organization (WHO). Our study found that among 270 respondents 44.07% had family history of smoking and 86.30% had family history of smokeless tobacco use. However, 68.89% answered that their family history had hypertension and 57.41% had diabetes mellitus. The rest of the conditions regarding asthma and cancer 13.70% and 1.48% provided affirmative answers about family history. Here, it was found that maximum portion of both urban & rural population have family history of smokeless tobacco use.
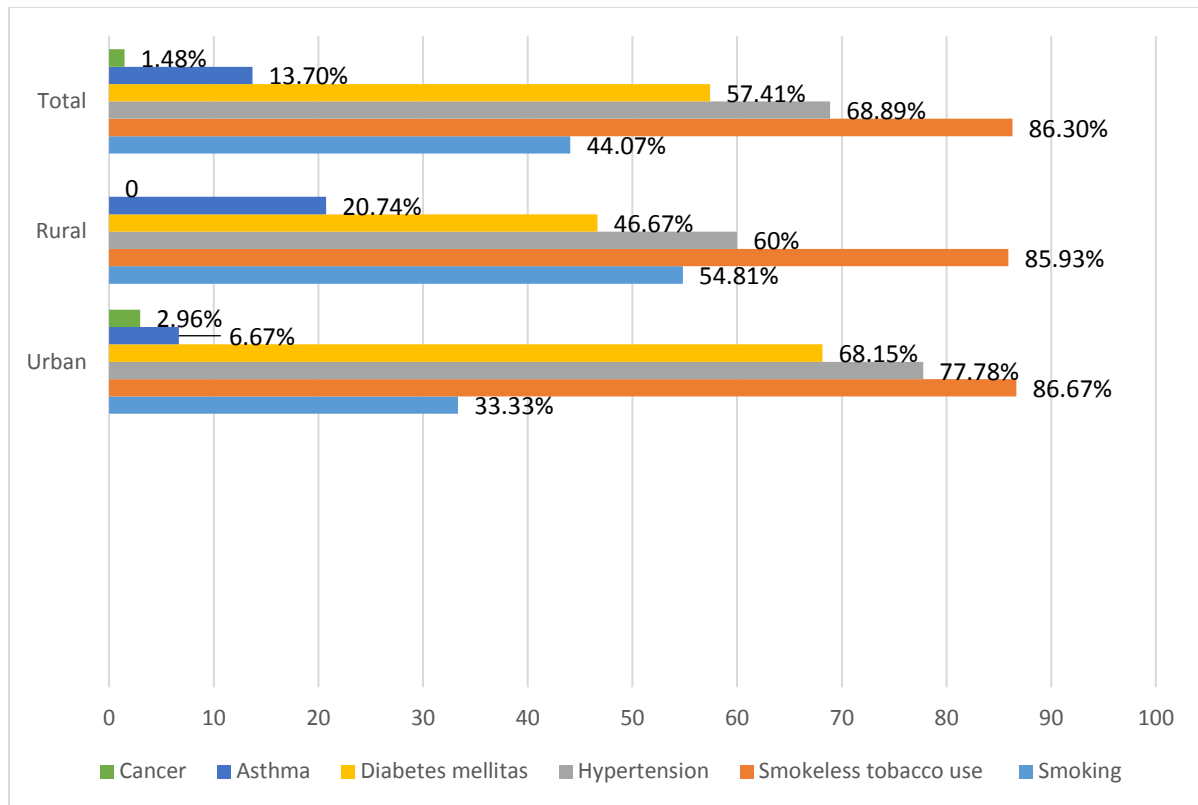
Figure 4.12: Family history of respondents

4.13 Knowledge of the Respondents about Tobacco use, Excess salt intake, Physical inactivity and Overweight

When the respondents were asked whether Tobacco use causes health problem then about 91.48% of the population knew that tobacco use can cause health problem. The rest of the population which includes 8.52% of the people had no idea that tobacco use could cause any sort of health problem in a person. In case of their knowledge about excess salt intake 80.74% of the population knew that excess salt intake may cause health problem especially for them who have hypertension. Around 19.26% of the population had no idea about this. When the respondents were asked about their knowledge in physical inactivity 95.19% gave positive answer whereas 4.81% thought that physical inactivity didn't cause any health problem. In case of overweight, 96.67% of the total population thought that overweight may cause serious health problem. But 3.33% of the population did not think that it can cause any type of health issues. After analyzing the data it was found that most of the population in urban area were

knowledge of tobacco use, excess salt intake, physical inactivity & overweight. Whereas in rural area only a few population were no knowledge about these.
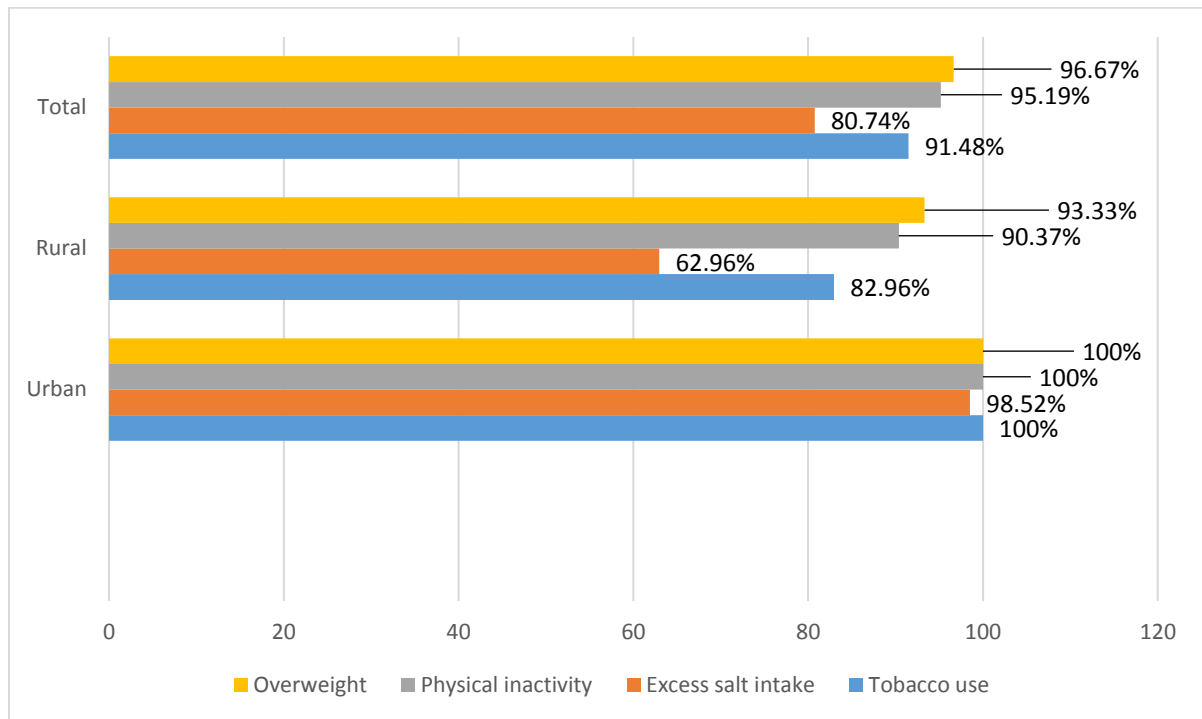

Figure 4.13: Knowledge of the Respondents

4.14 Status of Respondents about Tobacco product use

When the respondents were asked about the use of tobacco in their daily life then 40.74% people provide negative answer. Whereas 6.30% people take cigarettes, pipes or biri and 39.63% people take chewing, snuff, gul, jorda, pan-masala or any other types of smokeless product. Around 13.33% of the total respondents take both smoking and smokeless products. In this study, it was found that in rural area major population are addicted with smokeless tobacco use but in urban are maximum portion of the people have no habit of using tobacco product.
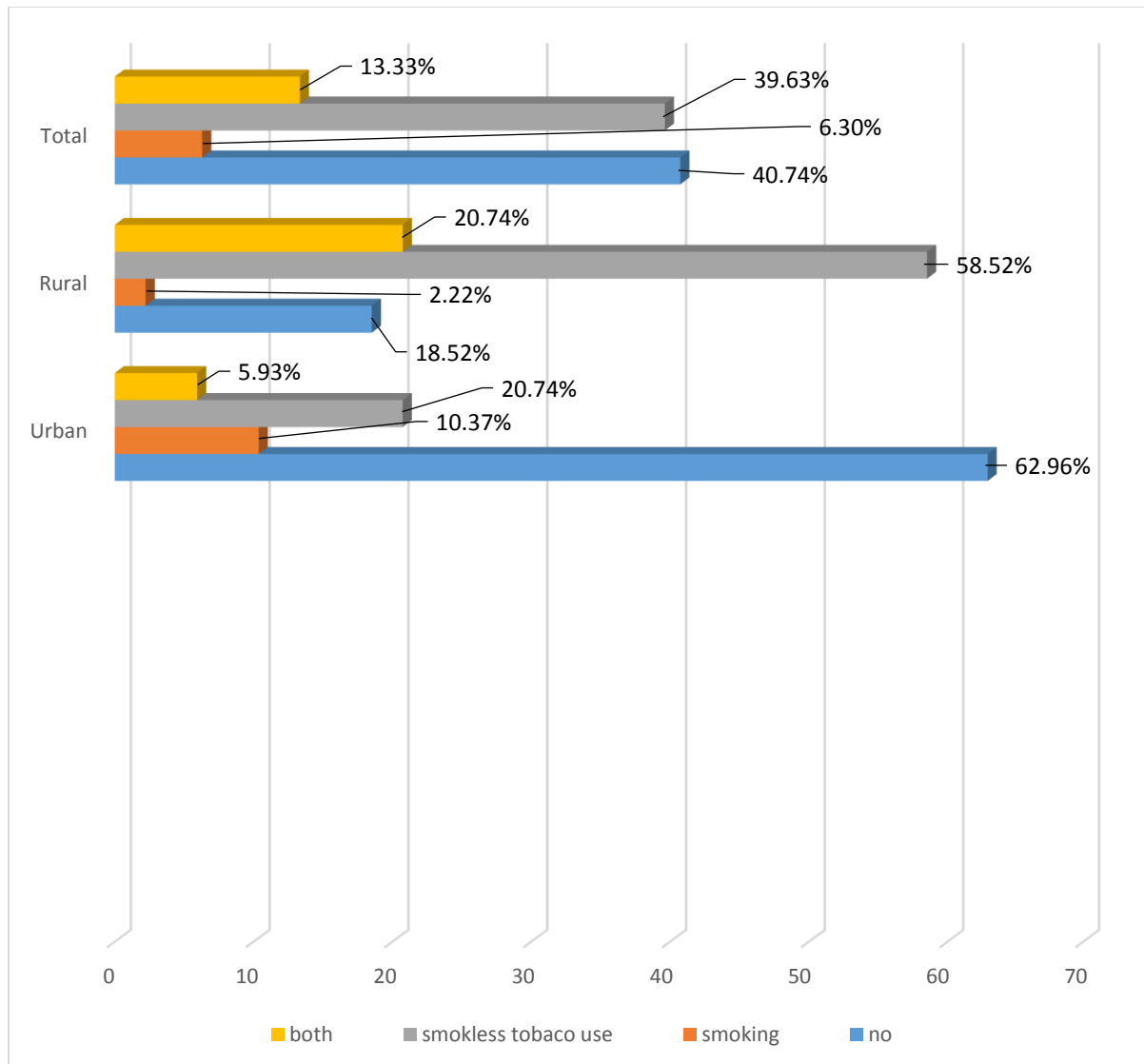
Figure 4.14: Status of Respondents about Tobacco product use

4.15 Status of Respondents about Dietary Habit (Fruit eating)

Normally the people who have taken fruits at least 5-7 days in a week that person is considered as in the satisfactory level and those who have taken fruits at least 1-4 days in a week that person is in the unsatisfactory level. In our study, we have found that among 270 of the total respondents 41.85% people are in the satisfactory level and 55.93% people are in the unsatisfactory level. About 2.22% of the total respondents do not take fruits at all. When conducting this study, it was found that both rural & urban population have satisfactory level of dietary habit of fruit eating.
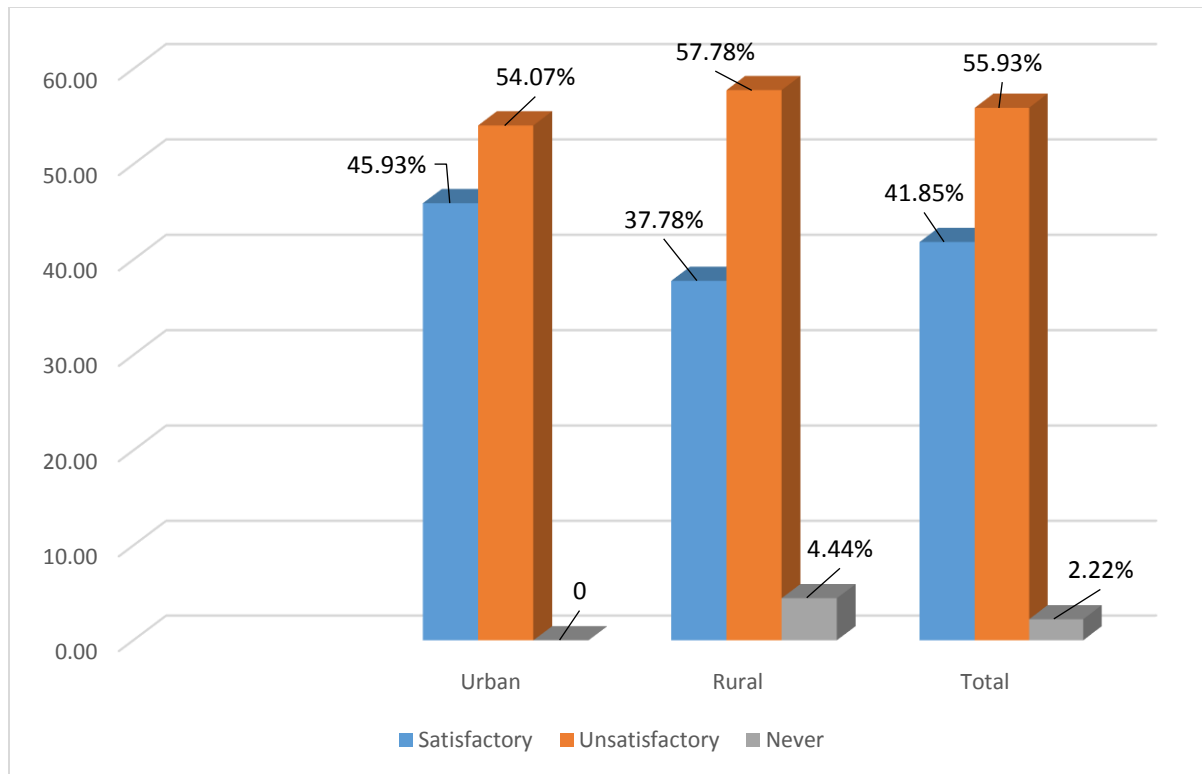
Figure 4.15: Status of Respondents about Dietary Habit (Fruit eating)

4.16 Status of Respondents about Dietary Habit (Vegetable eating)

Normally the people who have taken vegetables at least 5-7 days in a week that person is considered as in the satisfactory level and those who have taken fruits at least 1-4 days in a week that person is in the unsatisfactory level. In our study, we have found that among 270 of the total respondents 93.70% people are in the satisfactory level and 6.30% people are in the unsatisfactory level. All the respondents take fruits at different level. After this study, it was found that both rural & urban population have satisfactory level of dietary habit of vegetable eating.
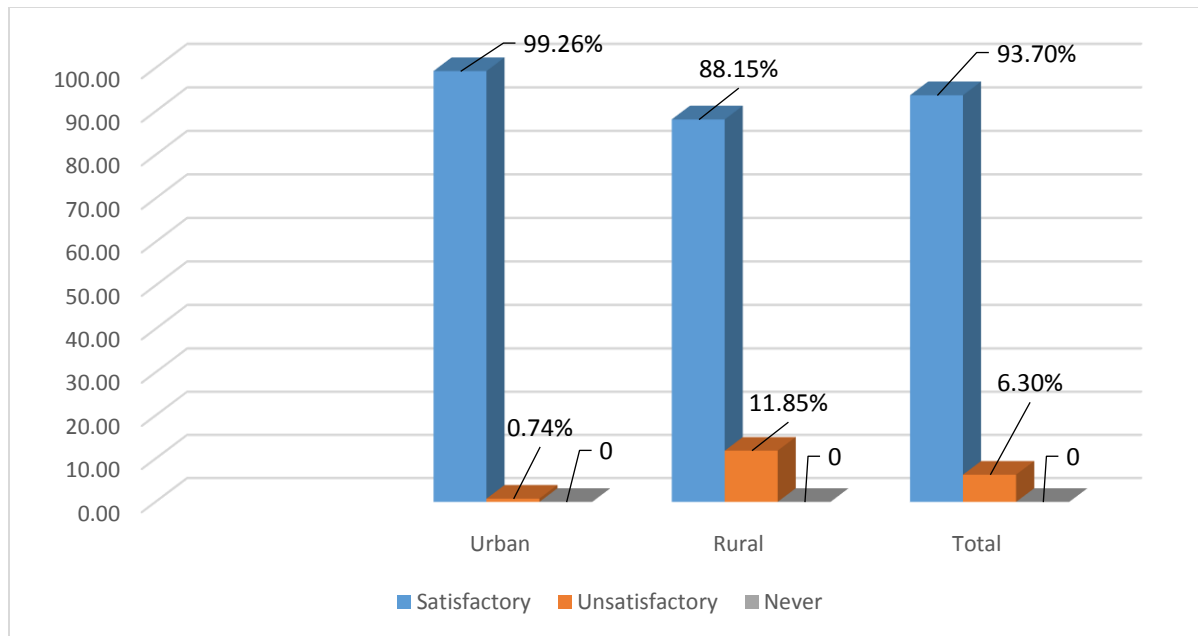
Figure 4.16: Status of Respondents about Dietary Habit (Vegetable eating)

4.17 Status of Respondents about Dietary Habit (Eating meal outside)

Eating meal outside is a greater threat for non-communicable diseases occurrence. Habit of eating meals is an important parameter in this study. The eating habits of this study population were analyzed about how many meals they take within home and how many they take outside. On the basis of that it was found that 98.15% of the people didn't take a single meal outside which is satisfactory in nature. Whereas none of the population take meal outside. The rest of the population 1.85% take a meal prepared outside the home at least 3-4 days per week which is moderate in nature. In this study it was found that most of the people both in rural & urban area have no habit of easting meal outside.
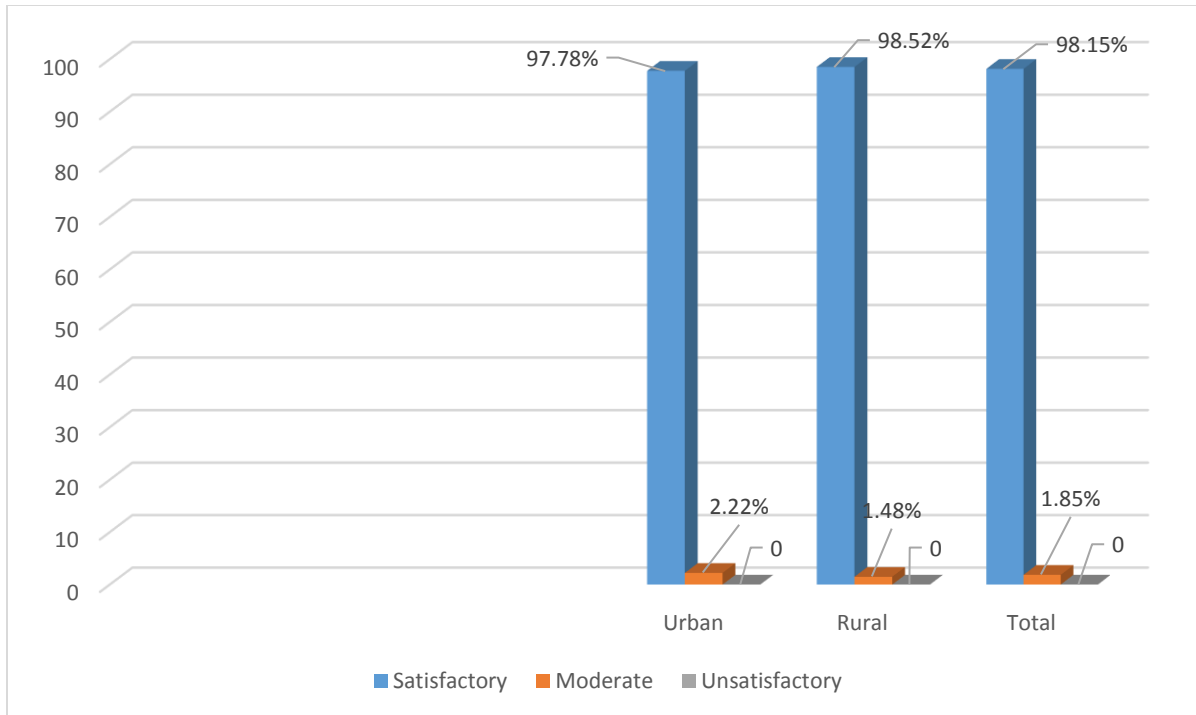
Figure 4.17: Status of Respondents about Dietary Habit (Eating meal outside)

4.18 Habit of adding Salt or Salty Sauce in the Food

After analysis of this data of 270 respondents, 8.89% of the total population take salt or add salty sauce in their food. Whereas 8.52% people often add salt or salty sauce in their food and 19.26% of the population sometimes added it. Out of the 270 respondents, 25.19% people rarely use salt or salty sauce in their food. Around 38.15% of the total population never added salt or any types of salty sauce in their food. It was surprisingly found that major population in rural area using salt in their food but the urban population are more concern about it.
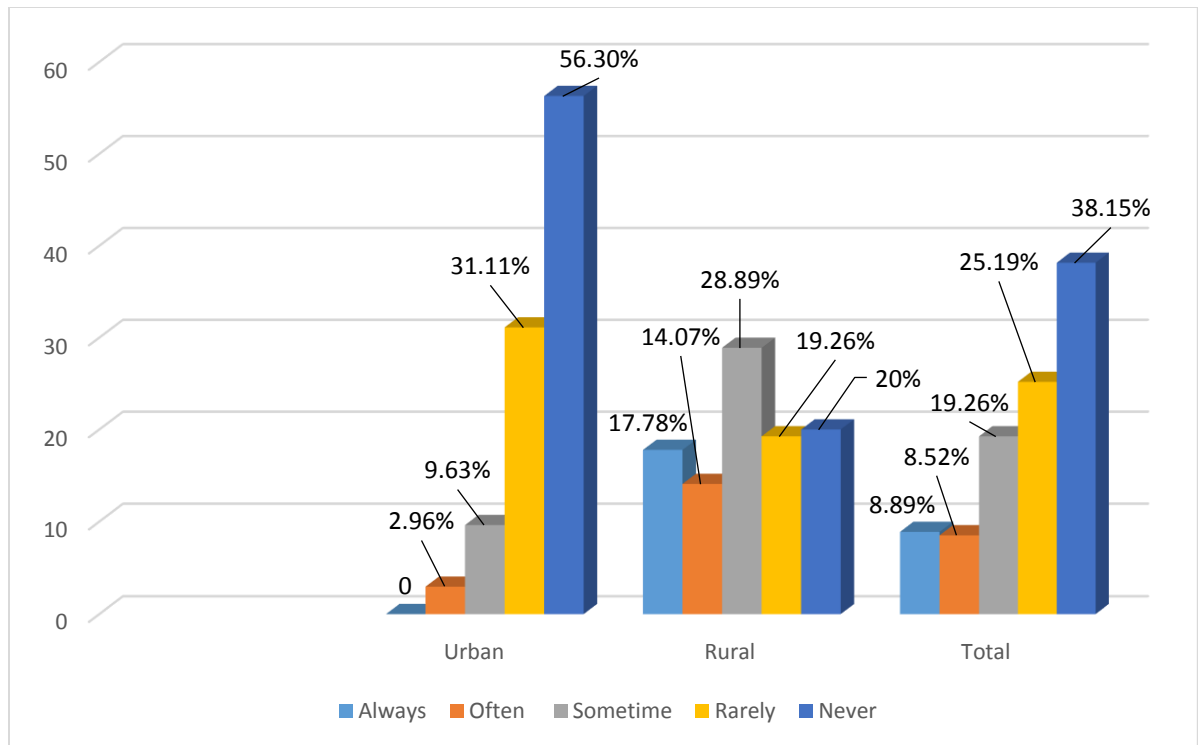
Figure 4.18: Habit of adding Salt or Salty Sauce in the Food

4.19 Habit of eating processed food High in Salt

When the respondents were asked about if they eat processed food high in salt content 9.26% gave positive answer. On the other hand 8.15% of the people often ate processed food high in salt content and 19.63% of the sometimes ate this type of food. Out of the 270 respondents 25.56% rarely and 37.41% never ate processed food high in salt content. Upon analyzing it can be easily said that major portion of the study population eats such kind of food which increases the risk of suffering from non-communicable diseases. Most of the urban population are more aware of processed food in high salt, whereas rural population have lack of knowledge about this.
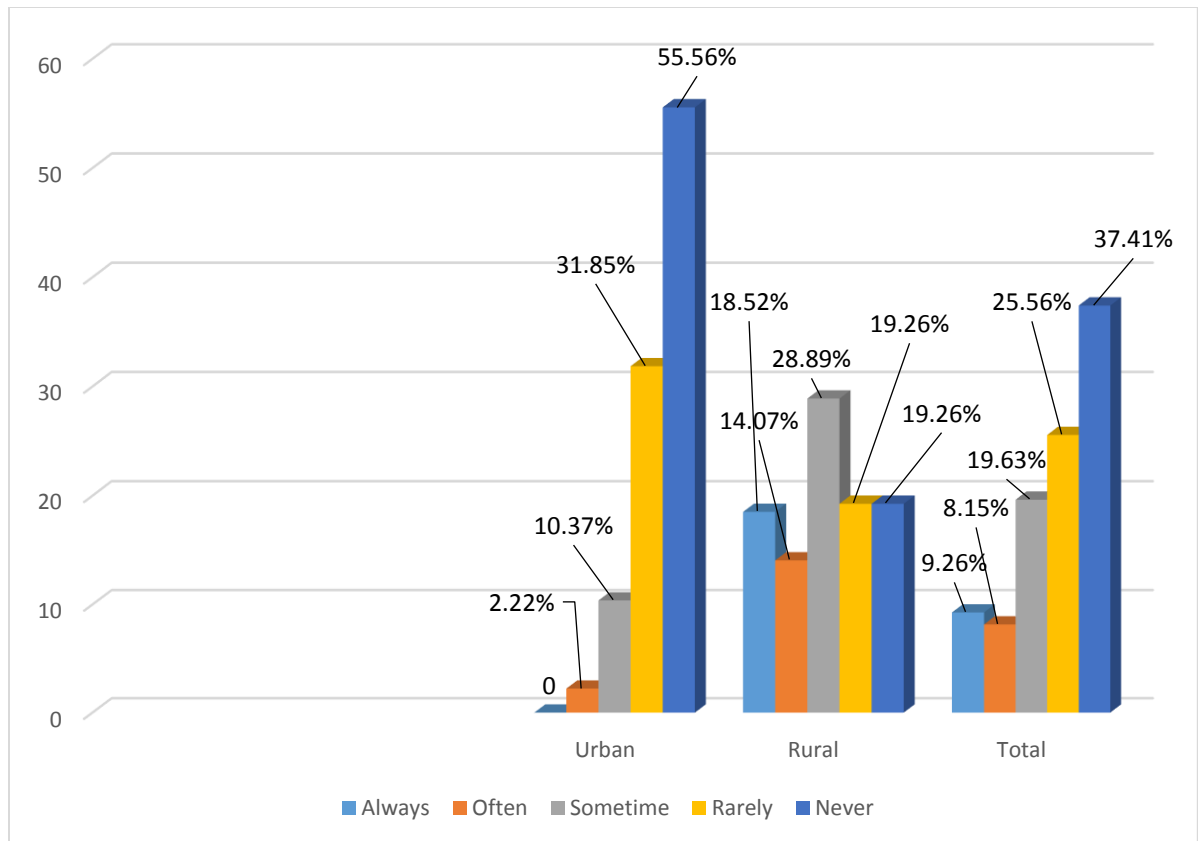
Figure 4.19: Habit of eating processed food High in Salt

4.20 Physical Activity status of the Respondents

In our study we collect data from 270 respondents in case of physical study on the basis of that increases respiration rate or heart rate and which is usually done for 10 minutes continuously. Generally physical activity for 150 minutes or more per week is considered as satisfactory level and in our study we found that 41.48%. Physical activity for less than 150 minutes per week is considered as unsatisfactory level and in this study we found that 41.11%. But a large amount of population which is 17.41% avoids physical activity. Upon analyzing this it can be said that the majority of the study population do not comply with the satisfactory level of physical activity which increases their chances for suffering from non-communicable diseases.
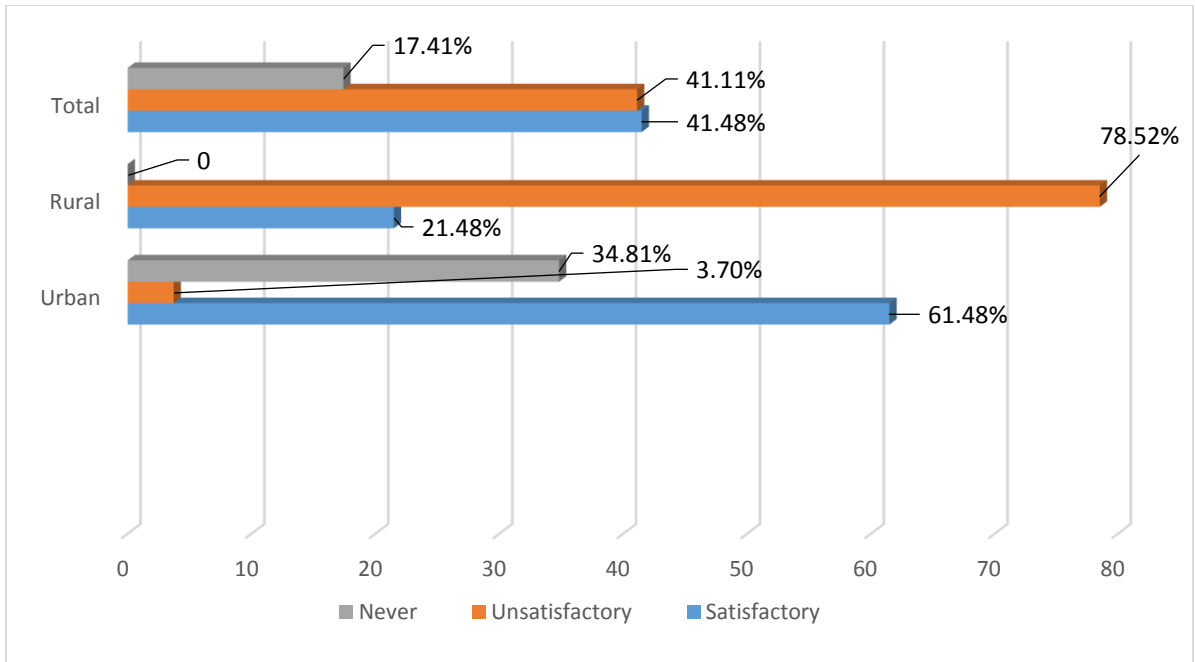
Figure 4.20: Physical Activity status

4.21 Sitting or Reclining Time

Among the respondents 87.04% of the population were passing their time between 0-2 hours upon which the study was conducted. Whereas, 12.96% population were reclining their time greater than 2 hours between 24 hours of the day. After analyzing this it can be observed that the majority of the study population have excess level of sitting or reclining time which increases their chances for suffering from non-communicable diseases.
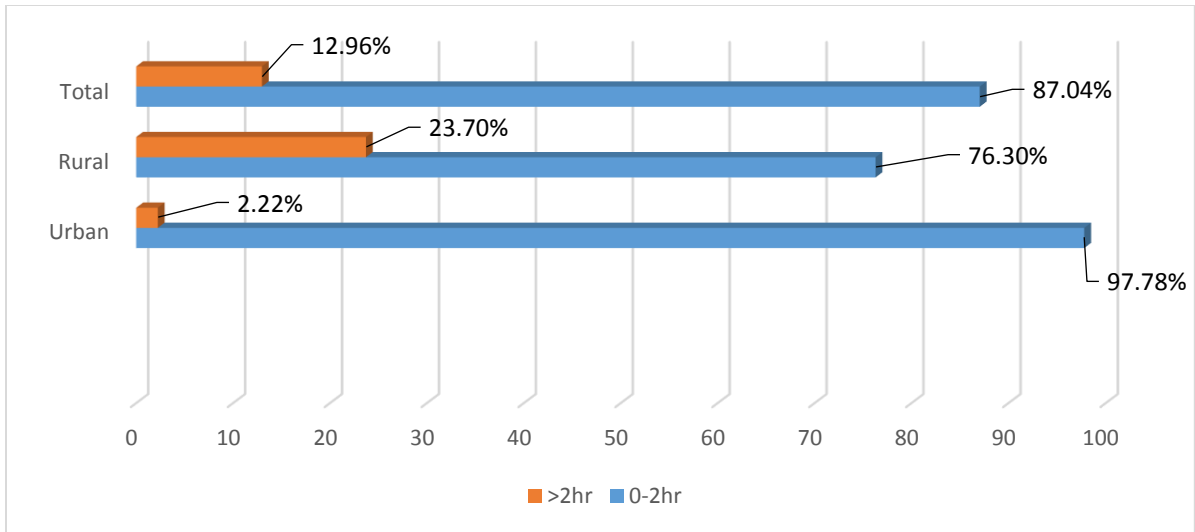
Figure 4.21: Sitting or Reclining Time

4.22 Doctor's Advice to the Respondents

Out of 270 respondents when they were asked about whether their doctors ever gave them any advices regarding their behavioral modifications on lifestyles regarding quit smoking tobacco 15.56% of the total respondents gave positive answer. 38.15% people were advised by the doctor to reduce salt in their diet and 68.15% were advised to eat five fruit servings each day. 39.26% of the population answered that they were advised by the doctor to reduce their fat and 44.07% people said that doctor suggest them to start physical activity. Among 44.07% of the total respondents said that they were advised by the doctor to maintain a healthy body weight.

Figure 4.22: Doctor's Advice to the Respondents

Chapter five

Discussion & Conclusion

5.1 Discussion

Non-communicable diseases (NCDs) have already become major killers in Bangladesh and also a major public health challenge for Bangladesh. NCDs (inclusive of injuries) account for 61 % of t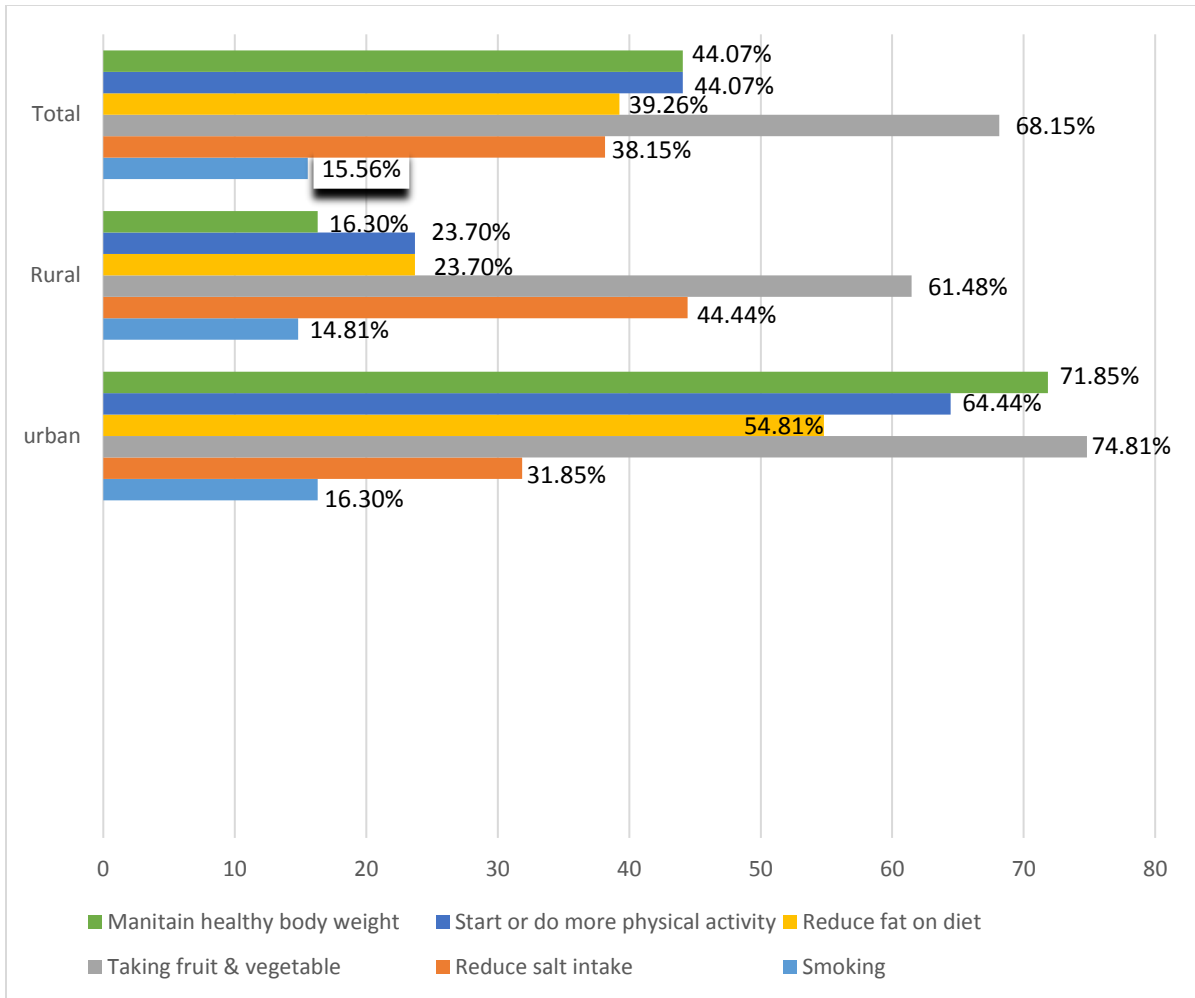he total disease burden in our country (Ahmed, 2017). This study was done to determine the prevalence of major NCDs and their prevalence among adult people of 3 different districts of Bangladesh and to determine the knowledge and awareness of the population about the risk factors. We also done this study in order to find out the comparison between rural & urban population & to find out which population are in more severe condition regarding NCD's.

This study was done among 270 respondents among which 58.15% were male and 41.85% were female. Majority of them aged between (36.67%) aged between 31-40 years and 20.89% were aged between 18-30 years. Regarding their educational status about 26.67% of the population passed HSC level where as this study found that population in urban area were more educated than the rural population as 7.78% population in rural area are still illiterate in rural area. Throughout this study it was found that 28.52% among the respondents were govt. service holder, whereas, 17.78% were house wife and most of the population in rural area were farmer, where in urban area it was govt. service holder.

In our study majority (54.44%) respondents were not suffering from any types of current medical conditions. About 17.04% of both urban & rural area were suffering from diabetes mellitus, where in previous two study it was found 5% & 4% of the documented patient have diabetes mellitus (Wahid, 2015; Jalil, 2016).   On the other hand total 34.811% were suffering from hypertension and according to our BP measure, where 43.70% urban population were suffered of hypertension & 57.78% of them were in the stage of prehypertension. In rural area, around 25% of the population were found having hypertension during our study. A study Zaman et al., (2015) showed 20.1% had hypertension & a study Ahmed et al. 2008 showed that 19.7% of the rural population were in the prevalence of hypertension, where in our study we found that 25.93% of the rural population have hypertension which indicates that the prevalence of hypertension increased with time.

It was noticed that most of the rural population take excess salt with their meal (31%) & that may relate the reason behind the high percentage (25.93%) pre-hypertension & hypertension (30%) in that area. Approximately 11% of the urban population take salt or add salty sauce in regular basis with their food. Still majority (80.74%) of the both population know that excess salt intake may cause health problem who have hypertension.

Based on body mass index 44.74% of the total population were found within the range of overweight and had greater risk of obesity in the near future. On the other hand 54.07% of the urban population were already in the range of obesity where 27.41% population in rural area had overweight, which indicates urban people are in more serious condition than rural population. So they were in greater risk of suffering from different kinds of Non-communicable diseases (Rawal 2016). Majority (96.67%) of the total population knew that overweight may cause serious health problem. However, there are a higher number of people who takes processed food high in salt which increases the chance of obesity (Shah, 2011; Pal, 2016). A study by Jalil, 2016 documented that seventeen percent respondents were overweight and 21% had abdominal obesity where in our study the percentage is increasing in noticeable amount which may be the reason of NCD's.

Low physical activity is considered as an important predictor of many chronic NCDs (Pal, 2016). The physical activity including exercise, walking at home or at work or during travelling for 150 minutes or more per week is considered as satisfactory level and in our study we found that 41.48% of total population have satisfactory level of physical activity. But a large amount of population avoids physical activity where most of the population both in rural & urban population aware about it that they are in the danger zone of NCD as because of low physical activity. According to Jalil *et al*., 2016, 35% of the participants had a low level of physical activity which is increased in our study for both urban & rural population. It this study it was found that 23.70% of the rural population & 12.96% of the urban population waste their time by gossiping or any other activities, which may influence NCD's. Hence it was found that most of the people in both urban & rural area not have the significant level of sleeping hours which may be one of the reason not to do any physical activity in the whole day. On the other hand, in our study most of the urban population are involved in physical activity but as they do more office work which in turn may cause NCD's.

Within last 30 days total 6.30% people said that they take tobacco and 39.63% people take smokeless tobacco products. Around 13.33% of the total respondents take both smoking and smokeless products. But 91.48% of the population knew that tobacco use can cause health problem. However, 44.07% had family history of smoking and 68.89% had family history of smokeless tobacco use. A survey conducted by Ahmed et al. 2017 reported that 31% of the total population consume tobacco & 36.3% population consume smokeless tobacco use. In comparison with our study we found both smoking & smokeless tobacco consuming is increasing in our study area. Again, it was noticed that smoking rate was high in urban area whereas smokeless tobacco consuming rate was high at rural area which indicates the reason behind NCD's in that particular area.

For behavioral alterations on ways of lifestyle, 44.07% respondents were reported for maintaining their healthy body weight. For accomplishing more physical exercise 44.07% were proposed. 39.26% of the respondents were encouraged to decrease fat in the eating regimen. Around 68.15% of the populaces were informed to take five servings concerning natural fruits or vegetables each. Reducing salt is additionally imperative, 38.15% of the populace were advised to do it. In conclusion, for stopping tobacco utilize 15.56% were advised. From the above analysis we can easily see that majority of the study population are asked to change their life style or behavioral modifications are required.

5.2 Conclusion

From the study results it can be concluded that knowledge about the detrimental effect of tobacco use, excess salt intake, overweight and physical inactivity among the respondents both in urban & rural population is quite satisfactory. Most of the people have the knowledge about their family history regarding risk factors of non-communicable diseases too. But, in case of the prevalence of NCDs, hypertension and diabetes are in the leading position where it can be assumed that significant amount of hypertensive people are influenced by tobacco uses both active and passive way, which is more prominent in urban population than the rural population. Even excess salt intake also plays a major role to raise the percentage of hypertension. Almost

half of the respondents are within the range of overweight and physical activity are not in a satisfactory manner which leads to different types of NCDs. Majority of the respondents take fruits and vegetables but doesn't comply with the standard which specially found in urban area. Prominent portion of the study population were also advised by doctors to change their life style or behavioral modifications are required. It is to be mentioned that this was a small portion of study which include 3 districts along with very little amount of respondents. This study could not measure the diabetes status of the respondents which is very important and commonly used in many other NCDs studies. In some cases when we went to measure waist circumstances for BMI calculation, all the female participant discourage to give it which is also an important parameter for measuring obesity as well as NCDs study. So, to get the complete knowledge regarding the prevalence and knowledge of NCDs risk factors further study on a large scale on different areas of Bangladesh is recommended.

Chapter Six

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