INTERVENTION TO CONTROL NON-COMMUNICABLE DISEASES AND IT'S RISK FACTORS AMONG UNIVERSITY EMPLOYEES

APRIL 2023 **REEMA PATEL**

B.Sc. (F.C.Sc) Dietetics

INTERVENTION TO CONTROL NON-COMMUNICABLE DISEASES AND ITS RISK FACTORS AMONG UNIVERSITY EMPLOYEES

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BY

REEMA PATEL

B.Sc. (F.C.Sc)

(Dietetics)

DEPARTMENT OF FOODS AND NUTRITION

FACULTY OF FAMILY AND COMMUNITY SCIENCES

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

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DEDICATION

I dedicate my M.Sc. Dissertation work to my loving

Father and Mother

For nursing me with love and affection.

Their dedicated partnership for the success in my life.

CERTIFICATE

This is to certify that the research work presented in this thesis has been carried out independently by

Reema Patel

Under the guidance of Prof. (Dr.) Annie Kuruvilla in pursuit of a Master's degree in Science (Family and Community Sciences) with major in Foods and Nutrition (Dietetics) and represents her original work.

Prof. (Dr.) Annie Kuruvilla

(Research Guide)

Prof. (Dr.) Mini Sheth

In-charge Head

DEPARTMENT OF FOODS AND NUTRITION

FACULTY OF FAMILY AND COMMUNITY SCIENCES

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

VADODARA, GUJARAT

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REEMA PATEL

ABBRIVETIONS

ANM- Auxiliary Nursing Midwifery

ASHA- Accredited Social Health Activist

AYUSH- Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy

BMI- Body Mass Index

CCU- Cardiac Care Units

CKD- Chronic Kidney Disease

CMNNDs- Communicable-malnutrition-newborn-Nutritional Diseases

COPD- Chronic obstructive pulmonary disease

CPHC- Comprehensive Primary Health Care

CRD- Chronic Respiratory Disease

CVDs- Cardiovascular Diseases

DALYS- Disability-Adjusted Life Years

DASH- Dietary Approaches to Stop Hypertension

FPG- Fasting Plasma Glucose

HbA1c- Glycated haemoglobin

HDL- High Density Lipoprotein

HWCS- Health and Wellness Centers

ICMR- Indian Council of Medical Research

IDF- Indian Diabetes Federation

JNC-8- Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure

KAP- Knowledge, Attitude and Practice.

LDL-C – Low Density lipoprotein - Cholesterol

MoHFW'S- Ministry of Health and Family Welfare

MUFA- Monounsaturated Fatty Acids

NCDs- Non- Communicable Diseases

NCEP ATP- The National Cholesterol Education Program Adult Treatment Panel

NCI- National Cancer Institute

NHM- National Health Mission

NHPS- National Health Policy

NPCDCS- National Programme for Prevention & Control of Cancer, Diabetes, Cardio-vascular Diseases and Stroke

NPHCE- National Programme for Health Care of the Elderly

PM-JAY- Pradhan Mantri Jan Arogya Yojana

PUFA- Polyunsaturated Fatty Acids

PHFI-Public Health Foundation of India

SEAR- South –East Asia Region

SFA- Saturated Fatty Acids

Uts.- Union Territories

VLDL-C- Very-low-density lipoprotein -Cholesterol

WC- Waist Circumference

WHO- World Health Organization

WHO PEN- World Health Organization- Package of essential non-communicable (PEN) disease interventions for primary health care

WHR- Waist-Hip Ratio

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Abstract

ABSTRACT

Background: Substantial global deaths are due to obesity, hyperlipidaemia, hyperglycaemia and raised blood pressure which are due to modifiable risk factors like excessive dietary salt intake, physical inactivity, unhealthy diet, tobacco use, harmful use of alcohol etc.

Objective: The present study was planned with a broad objective of intervention to control Non –Communicable Diseases (NCDs) & its risk factors among university employees.

Methodology: This study was conducted on employees (N=120) in a University in Gujarat, India. The baseline and post-intervention end-line survey consisted of biochemical parameters and anthropometric measurements and a pre-tested questionnaire on knowledge, attitude, and practice. The intervention comprised of counselling sessions in small group meetings & personal interaction, house-to-house visits, use of change agent and social media (**WhatsApp group for continuous monitoring, weekly update and suggestions).**Brochures on diabetes, heart care, obesity and healthy eating were made and distributed. Three sets of videos were designed, planned, and executed for physical fitness. Power point presentations were sent in WhatsApp group and individual diet for each participant was prescribed.

Results: More than half (**59%**) of the employees had a family history of NCDs and the mean age of population was **47.08±8.80years**. This age is crucial for prevention or beginning of NCDs. The intervention was carried out weekly for 3 months and there was a significant decrease in systolic blood pressure values. There was a decrease in the number of participants who were diabetic with respect to HbA1c values, from **28.6% to 22%**. **The overall knowledge scores of employees on NCDs and its risk factors had increased from pre-intervention (M = 40.53, SD = 22.71) to post-intervention (M=69.59, SD = 13.57) and it was statistically significant (t=-12.53, p<.001) .**The frequency of consuming fruits daily increased from **36% to 38%** and those consuming more than150 grams per day increased from **18% to 32%**. The consumption of vegetables per day increased from **47% to 54%,** adding extra salt at the table daily decreased from **41% to 30%.** The effect of intervention on the

consumption of foods containing high salt & fat reduced considerably. **70%** of the participants started walking / bicycling daily. The percentage of participants performing moderate-intensity sports/exercises increased from **34% to 50%** and daily number increased from **16% to 23%**. The percentage of participants performing morning and evening exercises also increased.

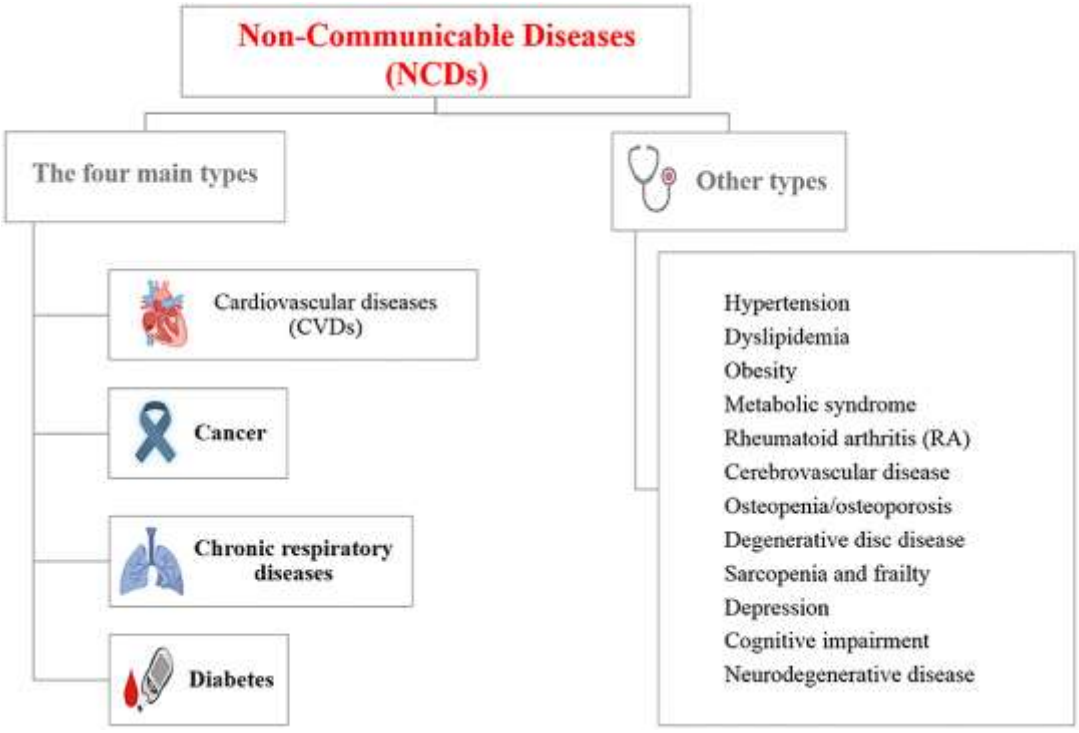
Conclusion-Though the study was on a small group and for short period of time there was considerable increase in knowledge & change in attitude & practice probably because the participants were at risk of NCDs or its risk factors. Longer period of intervention is necessary to see significant changes in these parameters.

Introduction

INTRODUCTION

Non-communicable diseases (NCDs) account for nearly three-quarters of all deaths worldwide, killing 38 million people annually. Low- and middle-income countries account for the majority of these deaths. Diseases or conditions known as NCDs are those that are not caused by infectious pathogens. There are a number of genetic, physiological, environmental, and behavioural factors involved in the development of these chronic diseases, which have a slow rate of progression and do not initially manifest any symptoms **(WHO, 2021).** Chronic diseases are more likely to develop because of the quick changes in people's lifestyles and behavioural patterns. Chronic non-communicable diseases are becoming more common among adults in both developed and developing countries. While in India it was 204 deaths per 1000 males and 147 deaths per 1000 females, the global adult mortality rate from NCDs in 2018 was 175.45 deaths per 1000 males and 121.19 deaths per 1000 females **(Baitha et al).**

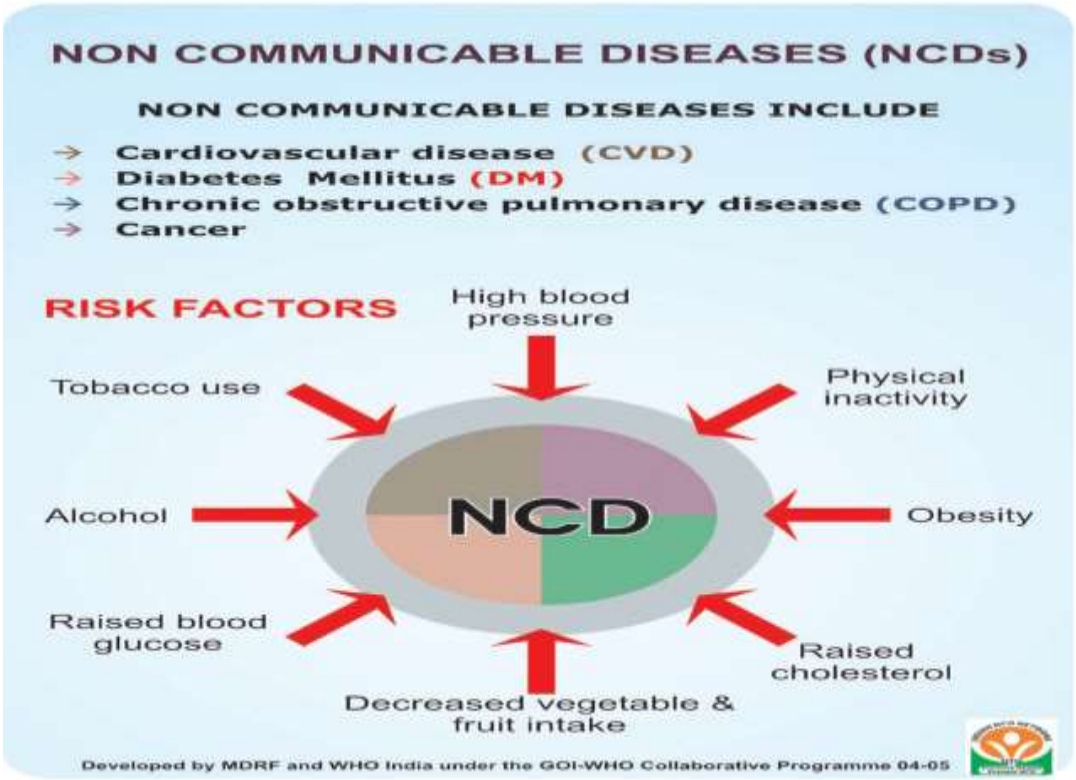
Fig.1.1: Types of Non-communicable diseases



The major Non communicable Diseases (NCDs) include:

- Cardiovascular diseases -Heart attacks and stroke
- Cancers
- Chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma)
- Diabetes

Fig.1.2: Non-communicable diseases and its risk factors



Source: National Health Policy

- **Cardiovascular Diseases-Heart Attack & Stroke**:
  A group of illnesses known as "heart disease" or "cardiovascular disease" are connected to a condition known as atherosclerosis. When a substance called plaque accumulates in the artery walls, a condition known as atherosclerosis occurs. The arteries become more congested as a result, making blood flow more difficult. Blood flow may be obstructed if a blood clot develops. This can result in a heart attack or a stroke **(AHA, 2017).**

Cardiovascular diseases include **(WHO, 2021):**

- Coronary heart disease(Heart attack, Congenital heart defects)
- Cerebrovascular disease (Stroke- ischemic stroke and hemorrhage)
- Rheumatic heart disease
- Peripheral arterial disease
- Heart failure
- Raised blood pressure (hypertension)

Risk Factors:

- Non-modifiable risk factors- age, sex, family history, medical history
- Modifiable risk factors- diabetes,high blood pressure, high cholesterol, smoking, physically inactive and being overweight/ obese.

- **Chronic Respiratory diseases:**

  Chronic Respiratory diseases **(**CRDs) are illnesses that affect the lungs' airways and other structures. Asthma, occupational lung disorders, pulmonary hypertension, and chronic obstructive pulmonary disease (COPD) are a few of the most common. In addition to cigarette smoking, other risk factors include air pollution, work-related dust and chemicals, and numerous lower respiratory illnesses throughout childhood. Although there is currently no cure for CRDs, there are a number of treatments that can help people with the disease to manage their symptoms and enhance their quality of life. These treatments include those that help widen important airways and reduce shortness of breath **(WHO 2023).**

  Asthma-is a chronic condition that affects both children and adults. Because of inflammation and tightening of the muscles surrounding the small airways, the airways in the lungs become narrow. Asthmatic symptoms include, shortness of breath, chest tightness, coughing and wheezing. These symptoms come and go and are usually worse at night or during exercise. Other common triggers can aggravate asthma symptoms. Depending on the individual, triggers may include smoke, fumes, dust,viral infections (colds), grass and tree pollen, potent soaps, and perfumes, seasonal changes, animal fur and feathers **(WHO,2022).**

Chronic obstructive pulmonary disease (COPD) - A common lung condition that limits airflow and affects breathing. It is also known as chronic bronchitis or emphysema. The lungs of people with COPD can become damaged or filled up with phlegm. Difficulty in breathing, wheezing, fatigue and coughing, sometimes with phlegm, are all symptoms. The most common causes of COPD are air pollution and tobacco usage. A higher risk of other health issues exists in COPD patients. Although COPD cannot be cured, symptoms can lessen if a person stops smoking, protects themselves from air pollution, and receives vaccinations to combat off infections **(WHO, 2023).**

- **Cancer :**

Cancer is a condition in which a few of the body's cells grow out of control and spread to other body parts. Since the human body contains trillions of cells, cancer can develop almost anywhere. Human cells normally divide and multiply to form new cells as needed by the body. The death of damaged or ageing cells is followed by the regrowth of new cells. When this orderly process is interrupted, abnormal or damaged cells multiply and grow when they should not. These cells can combine to form tumors, which are tissue lumps.Tumors can be malignant tumors(cancerous) or benign (non-cancerous) **(NCI,2021).**

According to **WHO 2020**, the most common causes of cancer death is due to- lung cancer (1.80 million deaths), colon and rectum cancer (916000 deaths), liver (830000 deaths), stomach cancer (769000 deaths) and breast cancer (685000 deaths).

Non- Modifiable risk factors:

- Age
- Sex
- Family History

Modifiable risk factors:

- Smoking & Alcohol
- Physically inactivity
- Obesity

- Unhealthy diet

➢ **Diabetes** :

Diabetes is a chronic illness that occurs when the pancreas no longer produces insulin or when the body does not properly utilize the insulin that is produced. The pancreas produces the hormone insulin, which functions as a key to allow glucose from food to enter the body's cells where it can be used to produce energy. In the blood, all carbohydrate foods are converted to glucose. Glucose is able to enter cells with the help of insulin. Inability to produce or use insulin properly results in elevated blood glucose levels known as hyperglycemia. Long-term high glucose levels are linked to tissue and organ failure as well as physical harm to the body **(IDF,2023).**

Types of diabetes **(IDF, 2023):**

- Type 1 diabetes- Although it can appear at any age but children and adolescents are the most likely to experience it. Because type 1 diabetes results in little to no insulin production in the body, controlling blood glucose levels requires daily insulin injections.
- Type 2 diabetes-Adults are more likely to develop diabetes, which accounts for approximately 90% of all diabetes cases. The insulin that the body produces is not properly utilized during type 2 diabetes. A healthy lifestyle, including increased physical activity and a nutritious diet, is the core part of type 2 diabetes treatment. The majority of people with type 2 diabetes, however, will eventually need to take insulin/ oral medications to maintain stable blood sugar levels.

Complication of diabetes:

- Cardiovascular disease- heart attack, stroke, etc.
- Oral complications- dental problem
- Kidney disease (nephropathy)- kidney failure
- Nerve disease (neuropathy)- diabetic foot complication and nerve or vascular damage
- Eye disease (retinopathy)- blindness

There are two types of risk factors for NCDs:

1) Non-Modifiable risk factors

- Age,
- Gender,
- Genetic factors,
- Ethnicity

2) Modifiable behavioral risk factors (WHO 2022)

- Tobacco: The use and consumption of tobacco accounts for over 8 million deaths every year which includes the effects of exposure to second-hand smoke, and is projected to increase considerably over the coming years.
- Excess salt intake: Overconsumption of salt and sodium has been linked to almost 1.8 million fatalities each year.
- Alcohol: NCDs, including cancer, account for more than half of the 3 million yearly deaths attributed to alcohol usage.
- Physically inactive: Inadequate physical activity is responsible for over 830000 fatalities each year.
- Raised blood pressure
- Overweight/obesity
- Hyperglycaemia (high blood glucose levels)
- Hyperlipidaemia (high levels of fat in the blood)

- **Tobacco**

  Tobacco use is a major risk factor for cardiovascular and respiratory diseases, over 20 different types or subtypes of cancer, and many other debilitating health conditions occur because nicotine in tobacco is highly addictive. The Tobacco outbreak is one of the massive public health hazards the world has ever faced. It is responsible for more than 8 million fatalities annually, including nearly 1.2 million deaths from exposure to second hand smoke. The most prevalent method of tobacco consumption worldwide is cigarette smoking. Water-pipe tobacco, other smokeless tobacco products, cigars,

cigarillos, roll-your-own tobacco, pipe tobacco, bidis and kreteks are examples of other tobacco products **(WHO, 2022).**

- **Excess salt**

  Salt is the main source of sodium and increasing the intake of sodium increases the risk of heart diseases and stroke, whereas it is also related to hypertension. The typical daily salt intake for most people is 9–12 grams, or roughly double the maximum amount advised. Salt in diet comes from processed foods which are particularly high in salt like processed meats like ham, salami and bacon, ready meals, instant noodles and salty snack foods or bread and processed cereal products. For adults, consuming less than 5 grams of salt per day lowers blood pressure and lowers the risk of heart disease, stroke, and coronary heart attack. Lowering salt intake has the primary effect of decreasing blood pressure. If worldwide salt consumption were decreased to the recommended amount, an estimated 2.5 million fatalities may be avoided each year. **(WHO,2020).**

Recommendations for salt reduction **(According to WHO2020)**:

- For adults: Less than 5 g of salt per day is advised.

- **Alcohol:**

  Alcohol is a toxic and psychoactive substance with addictive properties. Alcoholic beverages are a common part of many people's social lives in today's societies. Alcoholism causes a high disease burden, has negative social and economic consequences, and can even be harmful to others, including complete strangers, family, work mates and friends. Alcohol consumption is linked to an increased risk of developing serious non-communicable diseases like cardiovascular diseases, liver cirrhosis, cancers, as well as mental and behavioural disorders, including alcohol dependence.

- **Physical inactivity**:

  The World Health Organization defines physical activity “as any bodily movement produced by skeletal muscles that requires energy expenditure”. Physical activity encompasses all forms of movement. Cycling, walking, sports,

wheeling, active recreation, and play are all popular ways to stay active that can be done at any skill level and by almost everyone. Regular physical activity has been shown to benefit in the prevention and management of non-communicable diseases such as stroke, heart disease, a variety of cancers and diabetes. It has the potential to boost mental health, quality of life, and wellbeing. It prevents hypertension and help individuals to keep a healthy weight **(WHO, 2022).**

WHO 2022 guidelines and recommendation on physical activity:

- Adults should engage in at least 150-300 minutes of moderate-intensity aerobic physical activity per week or 75 to 150 minutes of vigorous-intensity aerobic exercises; or a similar amount of moderate- and vigorous-intensity exercises spread out over the duration of the week;
- Muscle-strengthening activities of moderate to high intensity that involve all major muscle groups should be done at least twice a week for additional health benefits.
- For additional health benefits, one may extend their weekly moderate- and vigorous-intensity activity to more than 300 minutes, or perform more than 150 minutes of each.

- **Raised blood pressure(Hypertension)**

High blood pressure is also known as hypertension. High blood pressure patients may not experience any symptoms. Blood pressure can be lowered by modifying one's lifestyle, such as giving up smoking, becoming more active and eating healthier, yet taking medication may be necessary for some people **(WHO 2023).**

Risk factor of hypertension (WHO 2023)

- Modifiable risk factors include unhealthy diets such as low intake of fruits and vegetables, diets high in trans- fats and saturated fats and excessive salt consumption, consumption of tobacco and alcohol, being overweight or obese and physical inactivity.
- Non-modifiable risk factors are co-existing illnesses such as kidney disease or diabetes, age over 65 years and a family history of hypertension.

- **Obesity** :

According to WHO"Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health". BMI is an assessment of body weight related to height and in most people correlates highly with body fat. It is determined by weight in kilograms divided by height in meters square (kg/m^2).

For adults: overweight is a BMI greater than or equal to 25 kg/m^2 and obesity is a BMI greater than or equal to 30 kg/m^2 **(WHO, 2023).**

- **Hyperlipidaemia (high levels of fat in the blood)**

  Hyperlipidaemia is also known as high cholesterol. A higher risk of cardiovascular diseases, such as heart disease and stroke, is associated with high cholesterol. Low density lipoprotein (LDL) cholesterol, which is bad, and High density lipoprotein (HDL) cholesterol, which is good, are the two types of cholesterol. An excess of the bad kind, or a lack of the good kind, raises the risk of cholesterol slowly accumulating in the inner walls of the arteries that supply the heart and brain. A hard, thick deposit of cholesterol can form on the inside of the arteries when it combines with other substances. Atherosclerosis, a condition caused by this, can narrow the arteries and reduce their flexibility. Heart attacks or strokes may occur if a blood clot forms and blocks one of these constricted arteries **(AHA, 2020).**

- **Hyperglycaemia (high blood glucose levels)**

  Diabetic patients suffer from high blood sugar, also known as hyperglycemia. Hyperglycemia in diabetics can be caused by a variety of factors. They include things like food and exercise, health issue, and diabetes-unrelated medications. Hyperglycemia can also result from skipping doses, not taking enough insulin, or using other blood sugar-lowering medications. It is critical to treat hyperglycemia. Hyperglycemia can become severe and lead to serious health issues that call for emergency care, including diabetic coma, if it is left untreated. Even mild hyperglycemia that persists can cause issues with the kidneys, nerves, eyes, heart, and blood pressure.

Programme related to Non-Communicable Diseases (NCDs)

The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS), which was launched in 2010 as part of the National Health Mission, is a technical and financial assistance programme offered to states and UTs by the Ministry of Health and Family Welfare of the Indian government (NHM). The programme focuses on building up infrastructure, developing human resources, promoting health, and raising awareness of non-

communicable disease prevention, early diagnosis, management, and referral to an accurate level of healthcare facility for treatment of non-communicable diseases (**NHM,2022).** NCD-Cells were set up under NPCDCS at the national, state, and district levels for managing programmes, and NCD-Clinics were set up at the district and community health centre levels to offer services for early diagnosis, treatment, and follow-up for common NCDs. The programme includes provisions for patients attending NCD clinics to receive free diagnostic services and medicine. Cardiac Care Units (CCU) are also being set up in specific districts to provide emergency Cardiac Care. To provide cancer treatment services, day care centres are being established in the targeted districts **(MoHFW, 2022).**

Action to Combat Non-Communicable Disease (NCDs)

The epidemic of NCDs cannot be stopped by merely treating the sick; healthy people must be prevented by addressing the underlying causes. The primary goal of the Ministry of Health and Family Welfare in preventing NCD deaths is to decrease major risk factors for NCDs. By eliminating the risk factors, the nation's economy will experience a significant boost while also saving lives **(Report-MoHFW N 2022).**

India is the first nation to adopt a National Action Plan with specific national targets and indicators intended to decrease the incidence of premature deaths from NCDs worldwide by 25% by 2025 in response to the World Health Organization's Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020. According to the global action plan, countries should set nine goals.

To combat household air pollution, India has established a tenth target, which is an unexpected move. The National Monitoring Framework for NCD Prevention and Control in India has committed to a 50% relative reduction in household solid fuel use and a 30% relative reduction in current tobacco used by **(Report-MoHFW 2022).**

The National Health Mission (NHM) and NPCDCS incorporation led to an increase in both human resources and infrastructure, especially in the form of frontline staff like the ANMs and ASHAs. To facilitate the early detection of common NCDs, population-based periodic screening for hypertension, diabetes, and common cancers like breast, cervical cancers and oral is facilitated with the active participation of these frontline workers. Additionally, the programme takes into account better co-morbidity

management, including diabetes and tuberculosis control, as well as the prevention and treatment of chronic kidney diseases (CKD) and chronic obstructive pulmonary disease (COPD). Another step towards promoting healthy lifestyle changes in the population is the integration of AYUSH and NPCDCS. The use of mobile technology in programmes like mDiabetes for diabetes control, mCessation for tobacco cessation, and 'no more tension' for managing mental stress are just a few examples of how social media is being used to spread awareness about NCD prevention and control **(MoHFW, 2022).**

Keeping in mind the modified strategies of the NPCDCS programme to promote health through behavioural change with involvement of community, civil society, community based organizations, media etc. and the objectives of HWCs in Ayushman Bharat Programme for Screening, Prevention, Control and Management of Non-Communicable diseases this study has the broad objective of **'Intervention to control Non-communicable Diseases (NCDs) & its risk factors among University Employees'**

Rationale

- Health of employees at the work place is an important factor for the progress of the institute
- Due to sedentary lifestyle, unhealthy food choices and harmful personal habits, employees are prone to NCDS and its risk factors.
- Hence this study was proposed to carry out Nutrition – Health interventions among university employees.

Review of Literature

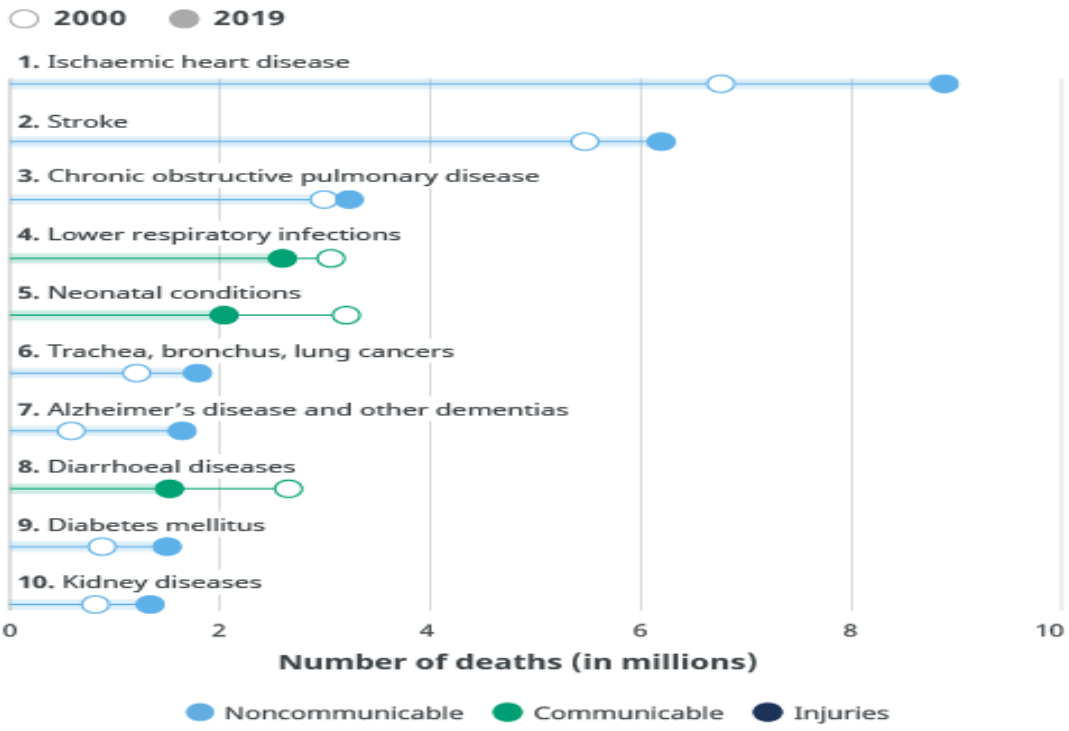
REVIEW OF LITERATURE

According to estimates, non-communicable diseases like diabetes, cancer, chronic respiratory diseases, and cardiovascular diseases cause about 60% of all fatalities. NCDs significantly reduce the number of years of life that could have been productive. Losses resulting from preventable deaths from heart disease, stroke, and diabetes are also expected to rise over time **(NHM, 2023).**

Burden of Non-Communicable Disease (NCDs)

NCDs accounted for (74%) seven of the top ten leading causes of death worldwide in 2019. Ischaemic heart disease is the world's leading cause of death, accounting for 16% of all deaths i.e. 8.9 million deaths as of 2019. The second and third most common killers, stroke and chronic obstructive pulmonary disease, respectively account for 11% and 6% of all fatalities. The number of deaths from bronchus, trachea, lung cancers has increased from 1.2 million to 1.8 million, placing it as the sixth-leading cause of death. Diabetes has risen to the top 10 causes of death with **80% increase in male fatalities due to diabetes (WHO 2019).**

Fig: 2.1 Leading causes of death globally

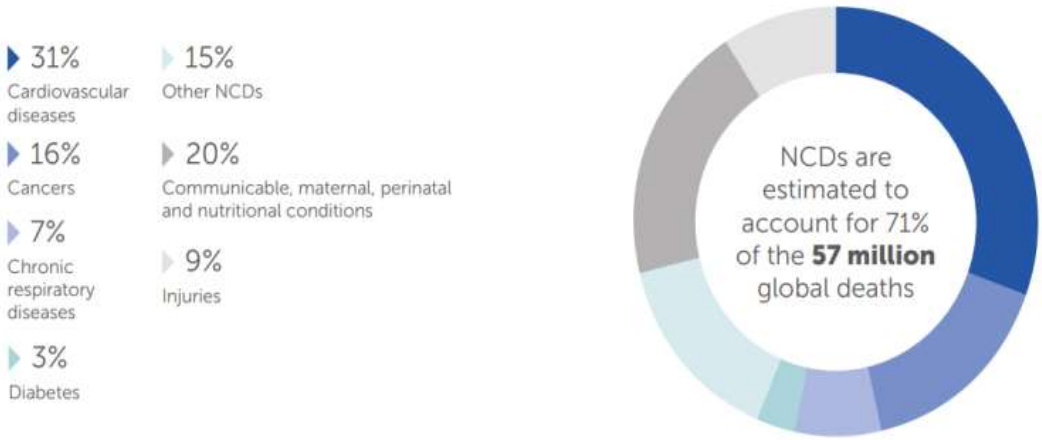


(Source: WHO Global Estimates, 2020)

Global Scenario

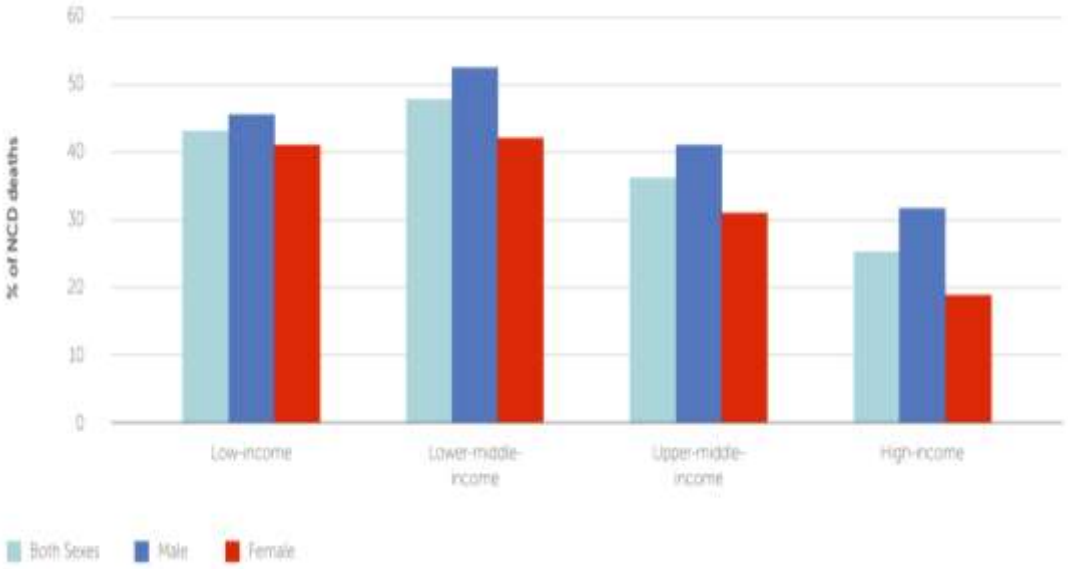
In 2016, NCDs were responsible for 71% (41 million) of the 57 million mortalities worldwide. The leading causes of death were cardiovascular diseases (17.9 million deaths, 44% of all NCD deaths and 31% of all global deaths); cancers (9 million deaths, 22% of all NCD deaths and 16% of all global deaths); chronic respiratory diseases (3.8 million deaths, 9% of all NCD deaths and 7% of all global deaths); and diabetes (1.6 million deaths, 4% of all NCD deaths and 3% of all global deaths). The global death probability from one of the four major NCDs was 18% in 2016, with men facing a slightly higher risk (22%) than women (15%). Low- and middle-income countries accounted for 78% of all NCD deaths and 85% of premature adult NCD deaths (LMICs). The chance of passing away from an NCD was nearly twice as high for adults in low- and lower-middle-income countries (21% and 23%, respectively), compared to adults in high-income countries (12%). Similar to low-income (43%) and lower-middle-income (47%) countries, high-income countries saw a reduction in the percentage of premature NCD deaths to almost half (25%) of all NCD deaths. **Males had a higher chance of dying from an NCD than females in all WHO regions.** Fortunately, the risk of dying from any of the four major NCDs has decreased from 22% in 2000 to 18% in 2016. The fact that premature adult mortality (those ages 30-69) was even more heavily influenced by NCDs (75%) suggests that NCDs are a problem for people of all ages **(WHO Country profile, 2018).**

Fig.2.2: Global Mortality Rate, 2016



Source: Non-communicable diseases Country Profiles, 2018, WHO

Fig.2.3: Proportion of NCD Deaths by Income Group, 2016



Source: Non-communicable diseases Country Profiles, 2018, WHO

Cardiovascular Diseases-Heart Attack & Stroke:

Cardiovascular diseases (CVDs) are the primary cause of deaths all over the world. It is estimated that 17.9 million individuals died from CVDs, in 2019, indicating 32% of death worldwide. Heart attacks and stroke were accountable for 85% of these deaths. Over three quarters of CVD deaths occur in low and middle-income countries. In 2019 out of the 17 million premature deaths, under the age of 70 years ,38% deaths were due to CVDs. Majority of cardiovascular conditions can be prevented by managing behavioural risk factors such as **unhealthy eating, tobacco use, physically inactive, obesity and heavy use of alcohol (WHO,2021).**

Chronic Respiratory diseases:

Chronic respiratory diseases (CRDs) affect the air ways of the lungs and other structures of it. Obstructive pulmonary disease (COPD), asthma, hypertension and occupational lung diseases are most common **(WHO 2023).**

Globally, COPD is the third leading cause of death, accounting for 3.23 million fatalities in 2019.Low and middle –income country (LMIC) account for about 90% of COPD mortality **(WHO 2023),** whereas asthma affects both children and adults and it claimed that around 262 million people were affected in 2019 and resulted into

455,000 deaths **(WHO 2022).**Other risk factors include dust, air pollution and frequent lower respiratory infections, additionally cigarette smoking. CRDs are incurable, however various forms of treatment that help to clear the airways and alleviate shortness of breath can help to regulate symptoms and enhance an individual's quality of life **(WHO 2023).**

Cancer:

Cancer is a major cause of death globally, estimating 10 million deaths nearly in 2020. Breast lung, colon and rectum and prostate cancers are most frequent. **Alcohol consumption, tobacco use, lack of physical activity, high BMI and lack of fruits and vegetables account for almost one-third of cancer fatalities.** In low and lower-middle –income nations, cancer- causing infections such as human papillomavirus (HPV) and hepatitis nearly account 30 % of cancer cases. Many cancerous tumors can be cured if identified early and treated successfully **(WHO, 2022).**

Diabetes:

Diabetes is a long-term, metabolic disease classified by elevated levels of blood sugar, which leads to blindness, kidney failure, heart attacks and lower limb amputation. Diabetes prevalence increased from 108 million in 1980 to 422 million in 2014. In low and middle – income countries, prevalence has been rising more rapidly than in high –income countries. There was a 3% increase in diabetes mortality rates by age, between 2000 and 2019. A total of 1.5 million deaths were directly related to diabetes in 2019, and 48% of these deaths occurred in those under the age of 70 years. Diabetes was responsible for another 460 000 kidney disease deaths, and **elevated blood glucose is responsible for around 20% of cardiovascular fatalities (WHO 2022).**

Modifiable Risk Factors:

- **Tobacco-** More than 80% of the 1.3 billion tobacco users worldwide resided in low- and middle-income nations, where the burden of tobacco related diseases and deaths were greatest. **(WHO, 2022).**
- **Excess salt-**Inadequate potassium intake less than 3.5 grams/day and high sodium consumption >2 grams/day, which is equal to 5 g salt/day lead to high blood pressure and raise the risk of heart disease and stroke. A corresponding

decrease in high blood pressure is the main advantage of reducing salt intake **(WHO 2022).**

- **Alcohol-** Alcohol use causes 3 million deaths each year. It is the leading cause of early death and disability in people aged 15 to 49, accounting for nearly 10% of all fatalities in this age group. The global disease burden for males and females accounts for 7.1% and 2.2% of harmful alcohol use, respectively **(WHO, 2022).**
- **Physically inactive-** Physical inactivity increases all causes of mortality and risk factors such as cardiovascular diseases, diabetes, cancer, high blood pressure, osteoporosis, lipid disorder, depression and anxiety. Both developed and developing countries account for 60% to 85% respectively of individuals leading a sedentary lifestyle. The rapid rise of illness such as cardiovascular disease, diabetes or obesity is due to physical inactivity, along with increasing tobacco use and unhealthy diet and nutrition **(WHO, 2002).**
- **Raised blood pressure (Hypertension) -** Hypertension is a leading cause of premature death globally and is also known as "silent killer". Raised blood pressure is a major medical condition that crucially increases the risk of heart, brain, kidney and other diseases. Globally, 1.28 billion adults aged between 30-79 years have hypertension. Nearly 46% of adults with hypertension are unaware that they are suffering from this illness. Nosebleeds, morning headaches, vision changes, fatigue, nausea, vomiting, confusion, anxiety and chest pain are symptoms of sever hypertension **(WHO 2022).**
- **Obesity-** Obesity and overweight are significant risk factors for a variety of chronic illnesses, including cardiovascular conditions like heart disease and stroke, which are the leading killers worldwide. Being overweight increases the risk of developing diabetes and its complications, which include kidney failure, blindness, and amputations of limbs. Excess weight can cause musculoskeletal disorders such as osteoarthritis. Obesity has also been linked to cancers such as breast, gallbladder, kidney, endometrial, colon ovarian, liver and prostate. Even mild obesity increases the risk of these non-communicable diseases, which become more serious as body mass index (BMI) rises **(WHO, 2023).**

  Obesity has nearly tripled globally since 1975. In 2016, 39% of adults aged 18 and up were overweight, with 40% of women and 30% of men being

overweight, and 13% being obese, with 15% of women and 11% of men being obese **(WHO 2021).**

- **Hyperlipidaemia (high levels of fat in the blood)-** Raised cholesterol levels raise the chances of developing heart disease and stroke. High cholesterol is responsible for one-third of all ischaemic heart disease worldwide. A total of 2.6 million deaths (4.5% of all deaths) and 29.7 million DALYS, or 2% of all DALYS, are thought to be related to elevated cholesterol. As a risk factor for ischemic heart disease and stroke, elevated total cholesterol is a major cause of disease burden in both the developed and developing worlds. In 2008, the global prevalence of elevated total cholesterol in adults was 39% in which men had 37% and women had 40% **(WHO 2023).**

National scenario

Status of Non-Communicable Diseases (NCDs) in India

According to the Indian Council of Medical Research (ICMR) study report **"India: Health of the Nation's States"(2017)-**The India State-Level Disease Burden Initiative, the percentage of mortality brought on by non-communicable diseases (NCDs) increased in India from 37.9% in 1990 to 61.8% in 2016.

India’s Epidemiological Transition

India's rapid social and economic development is causing a significant epidemiological transition. The disease patterns of the nation have changed over the past 26 years as a result of the population's ageing and the significant decline in mortality from communicable, maternal, neonatal, and nutritional diseases (CMNNDs), which has led to an increase in the burden of non-communicable diseases (NCDs) like diabetes, heart disease, and stroke which are contributing to the loss of health **(PHFI, 2022).**

The number of years lost to sickness, disability, or early death is used to calculate the Disability-Adjusted Life Year (DALY), a measure of the overall burden of disease. The leading individual causes of these NCDs among women from 1990 to 2016, are represented by the percentage change in DALYs in **Table 2.1 (MoHFW,2022).**

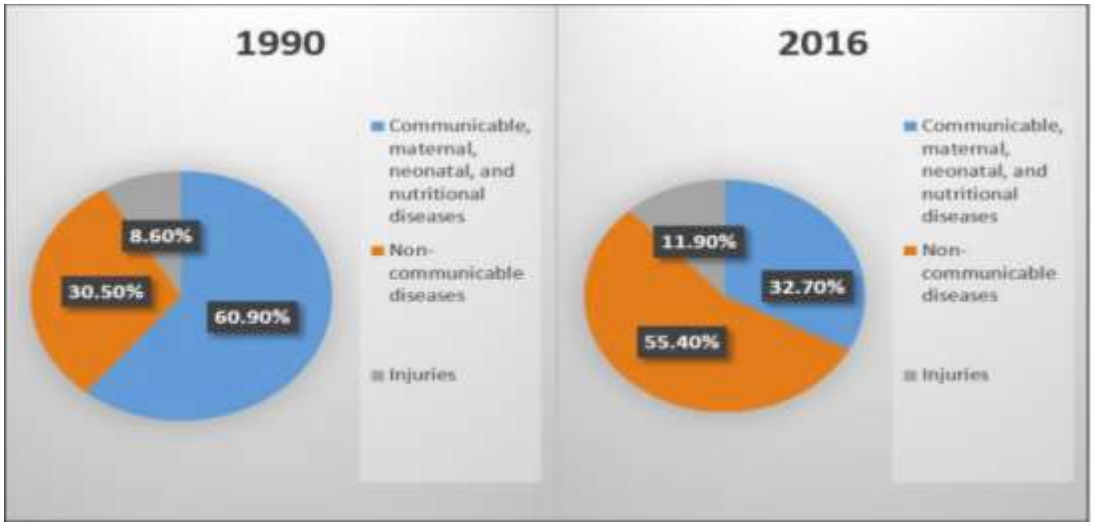
Table 2.1: Proportion changes in DALYs with number of NCDs among women from 1990 to 2016

Name of NCDs	Proportion of change in DALYs number	
	1990	**2016**
Cardiovascular disease (Ischemic Heart Disease)	2.9%	6.6%
Chronic Respiratory Diseases (CRDs)	2.7%	4.4%
Diabetes	0.7%	2.2%
Cancer (Breast)	0.7%	0.9%

Source: Ministry of Health and Family Welfare2022

In 2016, India accounted for 55% of NCDs, 33% of all DALYs caused by CMNNDs (communicable, maternal, neonatal, and nutritional diseases) and 12% of injuries. In 1990, this accounted for 30%, 61%, and 9% of DALYs, respectively **(Fig2.4).**

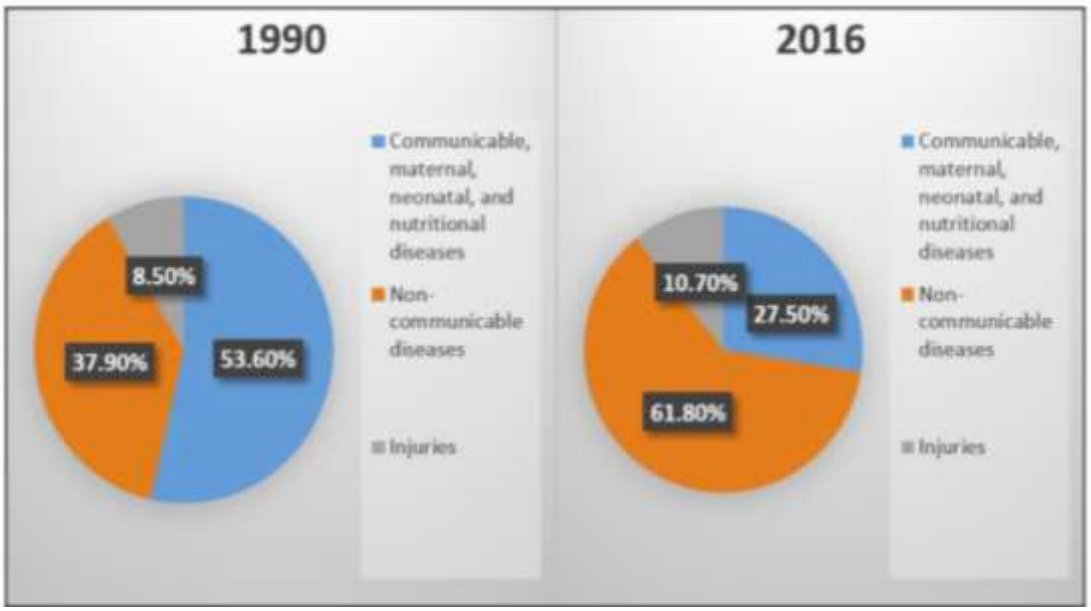
Fig. 2.4: Contribution of major disease groups to total DALYs in India



Source: Ministry of Health and Family Welfare2022

The NCDs increased from 37.9% to 61.8% and injuries increased from 8.5% to 10.7% whereas the proportion of all deaths in India attributable to communicable, maternal, neonatal and nutritional diseases (CMNNDs) decreased from 53.6% in 1990 to 27.5% in 2016 **(Fig:2.5).**

Fig. 2.5: Contribution of major disease groups to total number of deaths in India



Source: Ministry of Health and Family Welfare2022

In Gandhinagar district, Gujarat, India, a study was conducted using the WHO stepwise methodology to determine the prevalence and distribution of risk factors for non-communicable diseases among 1,805 urban and 1,684 rural residents in the age group of 15- to 64-years. Rural men had a higher prevalence of smoking (22.8%) and use of smokeless tobacco (43.4%) than urban men (smoking-12.8% and smokeless tobacco consumption-23.1%). The amount of fruits and vegetables consumed on an average in urban and rural areas varied significantly. In comparison to men and women in rural areas, urban men and women were found to have a higher prevalence of overweight and obesity across all age groups. In both areas, the prevalence of behavioural risk factors like overweight, and obesity increased with age **(Bhagyalaxmi et al, 2013)**.

In a study on 80 adults from Basulia village, in a rural population of Bangladesh, to determine the efficacy of a health education-based conventional intervention method for reducing NCD risk factors, found significant reduction in the usage of smokeless tobacco & tobacco sticks, significant decrease in the amount of salt consumed daily, and increasing intake of fruits and vegetables showing a positive response to the conventional methods of health education intervention. The WHO STEPS instrument

was used to collect data and the health intervention included weekly leaflet containing warning messages on NCD risk factors for three months **(Mondal et al, 2019).**

A study by **Chaudhari et al (2015),** to evaluate the knowledge of NCDs and their risk factors on 116 students from the Eklavya higher secondary school in Patan, Gujarat, before and after receiving educational interventional training found that there was significant improvement in the knowledge of NCDs after a single educational session which lasted for only 45 minutes.

Jessica Macedo et al (2021) had conducted a study on community-based interventions to improve the control of non-communicable disease in under-served rural areas of Brazil. The objective of the study was to determine whether long-term interventions, such as health worker training and patient health education, contribute to health improvements in patients with hypertension and diabetes from rural communities. To improve the management of diabetes and hypertension over the course of six months, medical and educational interventions were given. Baseline and post-intervention glycated hemoglobin (HbA1c) and blood pressure levels were measured. The monitored hypertensive patients (n = 276) had a reduction of 13.4 mmHg ($p = 0.021$) and 5.8 mmHg ($p < 0.001$) in mean systolic and diastolic blood pressure, respectively. Diabetic patients who were followed-up (n = 71) achieved a 0.55% ($p = 0.185$) reduction in HbA1c level. The study found that the interventions reduced blood pressure and HbA1c levels in rural Northeast Brazilian municipality patients with diabetes and hypertension.

A study was done by **Hadaye et al (2021)** on 73 patients with hypertension, to find the effect of Yoga intervention in the management of hypertension. The intervention group was given weekly yoga instruction and recommendations on exercise, diet, and standard medications for four months and it was seen that the mean systolic blood pressure was reduced by 7 mmHg and mean diastolic blood pressure was reduced by 5.3 mmHg which suggested that Yoga is a successful, secure, and affordable adjunct therapy for the treatment of hypertension. The level of stress was also found to be reduced by yoga. The study also suggested that control and prevention of hypertension could be greatly aided by dietary changes and physical activity.

A study by **Parashar et al (2022)** examined the effectiveness of the integration of components of WHO PEN protocols on improved clinical outcomes**.**The NCD patients enrolled in the experimental arm of this quasi-experimental study received behaviour change interventions regarding the four main NCD risk factors of physical inactivity, unhealthy diet, excessive alcohol consumption and tobacco use from trained non-physician health workers using "Brief Advice." The results showed improvement in the mean blood pressure levels and increase in the proportion of patients with controlled blood pressure levels. The secondary outcomes showed self-reported reductions in tobacco and alcohol intake, consumption of a heart-healthy diet, and regular physical activity.

A study by **Salwa, M et al (2019),** aimed to implement a behaviour change intervention and assess its effectiveness in reducing behavioural risk factors for NCDs among adolescents in Bangladesh by their study on students from two randomly selected secondary schools .This intervention delivered by trained facilitators during a health promotion session to a group of not more than 25 students at a time for a period of three months might raise awareness and subsequently make the practised risk behaviours of the adolescents more likely to change in the future and thus might make it more realistic in Bangladesh's resource-poor context.

A study by **Bhatt G et al (2021)** had proposed a cessation intervention for Punjab tobacco users based on the Transtheoretical Model (TTM), in NCD clinics operating under the NPCDCS programme of the Government of India, to evaluate the efficacy of a patient-centric, culturally-specific intervention on 200 participants. The study concluded that a culturally specific patient-centric intervention package focusing on behavior change appeared to be a sustainable way to help NCD patients quit tobacco successfully.

In Osun State's rural and urban local government areas (LGAs), this study compared the knowledge of HCWs (healthcare workers) working in PHC (primary health care) facilities regarding the prevention and control of NCDs. In PHC facilities in six rural and six urban LGAs, 400 eligible HCWs were recruited using a multistage sampling technique for a comparative cross-sectional study. The knowledge of HCWs

regarding the prevention and control of three selected NCDs (diabetes, hypertension, and chronic respiratory diseases) was evaluated using a pretested self-administered case-scenario questionnaire. The result showed that the proportion of HCWs with adequate knowledge was slightly higher in rural LGAs than in urban LGAs, but not statistically significant. It also concluded that the health care workers (HCWs) in PHC facilities in Osun State, Nigeria's rural and urban LGAs, lacked adequate knowledge of NCD prevention and control and training and re-training using relevant WHO NCD protocols and guidelines was suggested **(Akinwumi et al,2021)**.

A study by **Jayanna K et al (2019)** to identify gaps and design interventions for hypertension and diabetes across the care continuum using an established continuum of care framework was carried out in urban areas of Mysore city, covering a population of 58,000 people. The most important findings of the study were that 12 and 19% of adults had elevated blood sugar and blood pressure, which increased with age. A lack of education, tobacco use, high alcohol consumption (5.5%), insufficient physical activity (40%) and improper diet (81%) were also reported.

Methodology

METHDOLOGY

The present study was planned with the broad objective **'Intervention to control Non-communicable Diseases (NCDs) & its risk factors among University Employees'**

SPECIFIC OBJECTIVES

1. To assess the health of the university employees (pre-screening for biochemical parameters & anthropometric measurements).
2. To conduct a baseline survey to evaluate the knowledge on non-communicable diseases, namely, diabetes, cardiovascular diseases(CVDs), cancer & chronic respiratory diseases (CRD)
3. To conduct a baseline survey to evaluate the knowledge, attitude and practices about NCD risk behaviours such as unhealthy diet, physical inactivity, substance abuse etc. among the respondents.
4. To develop a health education intervention based on the baseline survey on NCDs & NCD related behavioural risk factors among the university employees.
5. To apply the health education intervention to the target group through effective communication approach and tools.
6. To conduct post interventional survey for biochemical parameters & anthropometric measurements
7. To conduct a post interventional survey with the same questionnaire used in baseline data collection for evaluating knowledge, attitude & practices related to NCDs & its risk factors.
8. To evaluate the intervention by comparing pre and post intervention data

Rationale

- Health of employees at the work place is an important factor for the progress of the institute
- Due to sedentary lifestyle, unhealthy food choices and harmful personal habits, employees are prone to NCDS and its risk factors.
- Hence this study is proposed to carry out Nutrition – Health interventions among university employees.

Research Questions

Q-1. Since, the university employees were screened for NCDs last year (2021-22), what is the way to make them aware of their status on NCDs & the risk factors they are suffering from?

Q-2. How can we address the problem to control NCDs & reduce the risk factors in a work place setting?

Q-3. How can NCD related Ayushman Bharat Programme of the Govt. of India be applied in a university setting?

Study design & setting

Sample Size

- The study is in continuation with the previous year's study (2021-22) on the prevalence of NCDs among the University employees. The teaching & non-teaching employees of the university were screened and the prevalence of non-communicable diseases, viz diabetes, CVDs, cancer & chronic respiratory diseases was reported as 10.15 percent (i.e. approximately 104 out of 1025 employees were suffering from either one of the major NCDs like diabetes, cancer & heart related diseases). World Health Organization instrument was used for data collection to find prevalence of NCD & NCD risk factors **(WHO STEP wise risk factor surveillance manual, 2017).**
- It was planned to include all the employees who were found to be suffering from NCDs (N=104). Due to unwillingness of few employees (who were having NCDs) to participate in this study at the initial stage itself, those employees suffering from stage-2 hypertension & obesity (major risk factors) were also included in the study and hence the final sample size was 120.

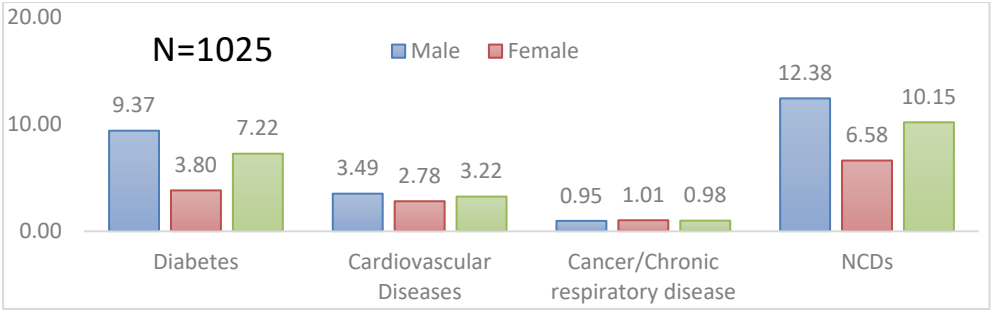
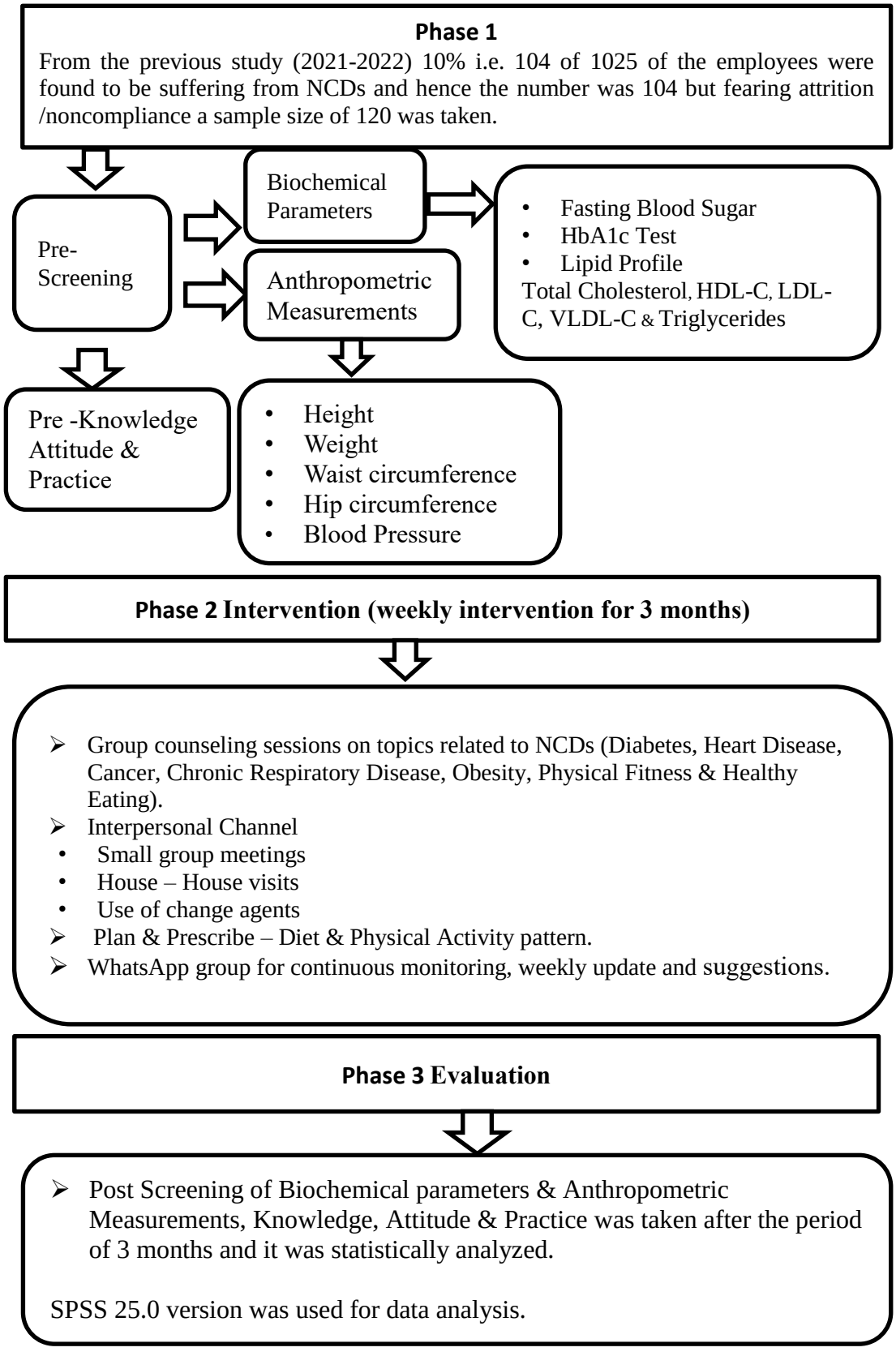


Fig: 3.1 Courtesy: M.Sc. Thesis- Sunil Baldaniya & Shivam Kalasariya (2021-22)

Description of the study:

Study Design



All the university employees suffering from NCDs & willing to participate were enrolled in the study. There were two types of participants - teaching & non-teaching. The study was divided into three phases.

The study was approved by the institutional ethics committee for human research (IECHR), Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara with the ethical approval number IECHR/FCSc/MSc/2022/37 **(Appendix II)**

Outcomes

Primary Outcome

- Nutrition-Health education will increase awareness, which may result in healthy behaviour related to NCDs.

Secondary Outcome

- Development of database of NCDs in the University employees for further future action.

Study Criteria

Inclusion Criteria

Those who were suffering from even one NCD and were willing to participate in the study.

Exclusion Criteria

Those who were not suffering from NCDs.

Phase-I

In the first phase of the study all the university employees who were part of the same study last year (2021-'22) and who were suffering from NCDs were approached for enrolment. Since few of them refused to be part of the study, those employees who had risk factors of NCDs, like stage-2 hypertension & obesity were included as participants to compensate for those who withdrew.

The objective of the study with goals and protocols was explained to each participant, individually and written informed consent was taken before any data was collected. All participants had complete freedom to withdraw from the study at any time **(Appendix-VI (A) & (B)).**

The enrolled participants had to go through pre-screening of biochemical parameters and anthropometric measurements. The biochemical parameters included screening for fasting plasma glucose, HbA1c, lipid profile and anthropometric measurements included height, weight, waist circumference & hip circumference. Blood pressure was measured and knowledge, attitude & practice regarding NCDs and its risk factors were also assessed. Any participant detected with high blood pressure during the baseline survey was referred to University health centre for further investigation and treatment. Similar patients detected with diabetes and high cholesterol and triglyceride levels were also referred for medical health.

Data was collected by one to one interaction personally.

This study was jointly planned and executed with the University Health Centre of Maharaja Sayajirao University of Baroda, Vadodara and hence the biochemical parameters were estimated by the pathological laboratory in the university health centre.

1. The biochemical parameters were assessed by using fully automated random access clinical chemistry analyzer –Erba Mannheimn (EM Destiny 180):

a. **Fasting plasma glucose**- Trinder method was used for assessing FPG. α-D-glucose in the sample was rapidly converted to the β-isomer by the action of Mutarotase which was then oxidised to yield gluconic acid and hydrogen peroxide in the presence of Glucose oxidase. The enzyme peroxidase catalyses the oxidative of 4-aminoantipyrine with phenol to yield a coloured quinonemine complex, with absorbance proportional to the concentration of glucose in sample.

b. **HbA1c**- Particle enhanced immune-turbidimetric test was used. HbA1c was determined directly without measurement of total haemoglobin.

c. **Lipid profile**

Cholesterol- reagent was based on the formulation of Allain et al and the modification of Roeschlau with further improvements to render the reagent stable in solution.

- Cholesterol esters are enzymatically hydrolysed by cholesterol esterase to cholesterol and free fatty acids.

- Free cholesterol, including that originally present, was then oxidized by cholesterol oxidase to cholest-4-en-3-one and hydrogen peroxide.
- The hydrogen peroxide combines with 4-aminoantipyrine to form a chromophore which may be quantitated at 505 nm.

Triglycerides

- Triglycerides are enzymatically hydrolysed by lipase to free acids and glycerol.
- The glycerol was phosphorylated by adenosine triphosphate (ATP) with glycerol kinase (GK) to produce glycerol-3-phosphate (DAP) by glycerol phosphate oxidase producing hydrogen peroxide (H_2O_2).
- In a Trinder type colour reaction catalyzed by peroxidase, the H_2O_2 reacts with 4-aminoantipyrine and TOOS (N-ethyl-N-Sulphohydroxy propyl-m-Toluidine) to produce a dye. The absorbance of this dye was proportional to the concentration of triglycerides present in the sample.

HDL-cholesterol- The assay was based on modified polyvinyl sulfonic acid (PVS) and polyethleneglycol-methyl ether (PEGME) coupled classic precipitation method with the improvements in using optimized quantities of PVS/PEGME and selected detergents. LDL, VLDL and chylomicron (CM) react with PVS and PEGME and the reaction results in inaccessibility of LDL, VLDL and CM by cholesterol oxidase (CHOD) and cholesterol esterase (CHER). The enzymes selectively react with HDL to produce H_2O_2 which was detected through a Trinder reaction.

The criteria for assessment of all parameters were as per the tables given below:

Table:3.1 Fasting Plasma Glucose & HbA1c test

Type 2 Diabetes	HbA1c %	FPG mg/dl	PPG mg/dl
Normal	<5.7%	<100mg/dl	<140mg/dl
Pre diabetes	5.7-6.45	100-126mg/dl	>140-200mg/dl
Diabetes	>6.5%	>126mg/dl	>200 mg/dl

Source: IDF – 2017; ADA, 2018; ISPAD, 2018.

Table: 3.2 Lipid Profile: (Total cholesterol, HDL-C, LDL-C, VLDL-C, Triglycerides).

LDL Cholesterol	**Cholesterol**	**HDL Cholesterol**	**Triglycerides**	**Non HDL Cholesterol**
Optimal: <100	Desirable: <200	High: >60	Normal: <150	Desirable: <130
Near Optimal: 100-129	Borderline High: 200-239	Low: <40	Borderline High: 150-199	Borderline High: 139-159
Borderline High: 130-159				
High: 160-189	High: >240		High: 200-499	High: 160-189
Very High: >190			Very High: >500	Very High: >190

Source: New ATP III Guidelines according to NCEP, May 2001

2. Anthropometric measurements

Physical measurements such as blood pressure (BP), weight, height, waist circumference (WC), and hip circumference (HC) were taken using the standardized protocol. All measurements were taken in the respective workplaces of the employees during recess timings.

Height:

Height is a linear measure of body mass. Height measurements were taken on university non-teaching employees using flexible, non-stretchable fiber glass tape. Participants were instructed to stand upright position without touching anything, to remove their shoes, to place their heels against the wall, and to look straight ahead. A scale (ruler) was placed on the subject's head, and a mark was made with a pen on the wall indicating the subject's height, which was then measured with a measuring tape.

Weight:

Weight is a significant element in anthropometric measurements. A bathroom scale was used to weigh all of the subjects. It can be used on the field because it is portable. Participants were instructed to stand on the scale upright position, without touching anything, and to wear no heavy clothing, jewellery, or shoes. They were instructed to maintain a straight posture. The scale was calibrated to zero prior to taking the measurements.

BMI:

Participants were categorized as underweight, normal, overweight, or obese in accordance with Asia Pacific standards using their body mass index (BMI), which was calculated using height and weight data obtained from anthropometric measurements. The BMI of the participants were assessed using the Asia-Pacific standards (**Table: 3.3**).

Table: 3.3 BMI cut offs:

Category	BMI (WHO) kg/m^2	BMI(Asia-pacific) kg/m^2
Underweight	<18.5	<18.5
Normal	18.5-24.9	18.6-22.9
Overweight	25.0-29.9	23-24.9
Obesity	30.0-34.9 (Obesity-1) 35.0-39.9 (Obesity-2)	≥25
Extreme Obesity	>40.0 (Obesity-3)	

Source: New ATP III Guidelines according to NCEP, May 2001

3. Blood Pressure Measurements

An automatic digital sphygmomanometer (OMRON) with an appropriate sized cuff was used to measure the patient's blood pressure at least twice while they were resting in a sitting position. The participants were asked to sit down on a chair and rest their right elbow on a table. Blood pressure was measured twice allowing at least 5 min interval between each measurement. The mean of both the readings was taken into

analysis and JNC 8 Guidelines **(Table: 3.4)** was used to categorise them into normal, pre-hypertensive & hypertensive.

Table: 3.4 Blood Pressure cut offs:

Category	**Systolic blood pressure (mm Hg)**	**Diastolic blood pressure (mm Hg)**
Normal	<120	<80
Pre-Hypertension	120 - 139	80 - 89
Hypertension	>140	>90

Source: Joint National Committee (JNC 8 Guidelines)

Abdominal obesity:

Table: 3.5 Waist Circumferences:

Waist Circumference
Men : >90cm
Women : >80cm

Table: 3.6 Waist Hip Ratio:

Waist Hip Ratio:
Men : >0.96-1.00
Women : >0.81-0.85

4. Pre – Questionnaire

- Two different self-administered questionnaires were prepared with the help of STEPs Survey of NCD risk factors**(WHO STEP wise risk factor surveillance manual, 2017).**

The questionnaires were made first in English and then translated into Gujarati. One questionnaire was only on assessing the knowledge related to NCDs & its risk factors and the second one was on attitude & practices related to behavioural risk factors of NCDs. These were then pre-tested among a small similar population and necessary modifications were done. The finalized questionnaire (Appendix- VII & VIII) was used both in pre-intervention baseline and post-intervention end line survey.

There were eight sections in the first questionnaire. The first section of the questionnaire was on socio-demographic information of the participants. The second

section contained questions about knowledge related to NCDs. The third section covered questions on knowledge on diabetes, fourth section dealt with heart diseases & hypertension, fifth with knowledge on cancer, sixth was related to chronic respiratory diseases, seventh section was on the risk factors and causes of obesity, eighth and ninth were on knowledge regarding attitudes, namely physical activity and diet respectively.

The second questionnaire was on attitude & practices. These questions were used to evaluate the attitude & practices regarding substance abuse, dietary habits and physical activity/ sedentary lifestyle.

Any information about the risk behaviors of the individual participants were not disclosed. Intervention through social media (WhatsApp group) was given in two groups for the sake of convenience. Maximum efforts were taken to minimize any perceived physical or psycho-social risk for participating in this study.

Outcome variables

Following outcome variables were measured.

Knowledge

The questions in each section of the first questionnaire related to the knowledge about NCDs and its risk factors was assessed using quantile concept of statistical analysis. The grades were divided into four quantiles- scores were given for each question (one score for each question) and the scores were graded as < 25% score as very poor, 25% - 50% as poor, 51%-75% as average and >75% as good.

Phase II Developing and Applying the Health Education Tool

The intervention consisted of the following:

1.Interpersonal channel 2. House to house visits 3. Use of change agents 4. Small group meetings 5. Social media (WhatsApp group) for continuous monitoring, weekly update and suggestions.

- **Brochures were designed on Diabetes, Heart Care, Obesity (Mind your weight), Healthy Eating and printed in English & Gujarati.**
- **Three sets of videos were designed, planned & executed by the researcher which included 1. Different types of Yoga 2. Warm up /moderate exercises**

3. High intensity / vigorous exercises

- **Power point presentations were made in English & Gujarati on Diabetes, Heart Disease, Cancer, Chronic Respiratory Disease, Obesity, Physical Fitness & Healthy Eating (Appendix- IX).**
- **Individual diets of each participant for three consecutive days were taken and the average calorie intake was calculated. Customized diet chart was made for each participant according to three main categories- diabetics, hypertensive, overweight/obese subjects. A minimum diet of 1200 kcal/day was suggested for obese subjects and for others depending on the lifestyle (sedentary or physically active), 1600-1800 kcal/day was prescribed without making much changes in the daily cuisine of each participant.**

The brochures **(fig.3.2)** and power point presentations were built using the information and statistical data from the official website of World Health Organization. The health education messages were on the major NCDs and its risk factors. A weekly intervention was provided to the participants throughout 3 months followed by post-test. Paired t-test was done to see the significance of the intervention.

The main messages of the intervention centered on better diets (reducing salty diets and encouraging the consumption of vegetables and fruits), an increase in physical activity to lower body mass index, and ultimately, prevention of hypertension.

Fruit intake was defined as insufficient when it was < 2 servings per day (2 exchange) i.e. 150 gm. Vegetable intake was defined as insufficient when it was<3 servings per day (3 exchange) i.e. 250 gm.

Intervention was given on the following topics:

Topic 1: Hypertension & Heart Care

1. Understanding the basic pathology and etiology of heart diseases with special emphasis on atherosclerosis, stroke and hypertension.
2. Understanding and identifying the effect of lifestyle behavior on heart diseases
3. Recognizing the importance of reducing salt & salty foods in the diet, switching over to good fats (explaining SFA, MUFA, PUFA).
4. Emphasizing DASH (Dietary Approach to stop Hypertension) diet

4. Raising curiosity on classification of hypertension, classification of lipid profile, classification of BMI.

Topic 2: Diabetes

1. Understanding the basic pathology and etiology of diabetes with special emphasis on the indicators like fasting plasma glucose, post prandial glucose, HbA1c.
2. Understanding and identifying the effect of lifestyle behavior on diabetes.
3. Recognizing the importance of consuming complex carbs, fiber-rich foods, reduction of high fat foods & refined carbs.
4. Raising curiosity on glycemic index of foods- explaining the ready-reckoner leaflet on low, medium & high GI foods.
5. Emphasizing the complications of uncontrolled diabetes.

Topic 3: Diet

1. Understanding the importance of healthy eating habits- the concept of 'My Plate'
2. Raising curiosity on what should be the food options to prevent NCDs- explaining the calorie content of foods.
3. Understanding and identifying the link between unhealthy food options and NCDs.
4. Understanding and identifying healthy and unhealthy food options depending on its function.
5. Emphasizing the role of functional foods in preventing NCDs.
6. Demonstrating how to overcome barriers to healthy diet.

Topic 4: Obesity

1. Demonstrating the concept of normal weight and obesity- explaining the ideal weight to stay fit & maintain it.
2. Enabling to calculate one's Body Mass Index (BMI) status.
3. Understanding and identifying the potential causes of obesity.
4. Explaining the concept of the 'Eat right India' movement- reduction in consumption of salt, sugar & fats.

Topic 5: Physical activity

1. Demonstrating the concept of physical activity and sedentary behavior
2. Understanding and identifying the link between physical inactivity and NCDs

3. Understanding the benefits of three types of exercise (i.e., aerobic, strength building and stretching) and the calories burnt in each category & encouraging to perform each type.
4. Raising curiosity on how much and what type of physical activity should be done to prevent NCDs.
5.Making healthy choices for lifestyle behavior and setting goals

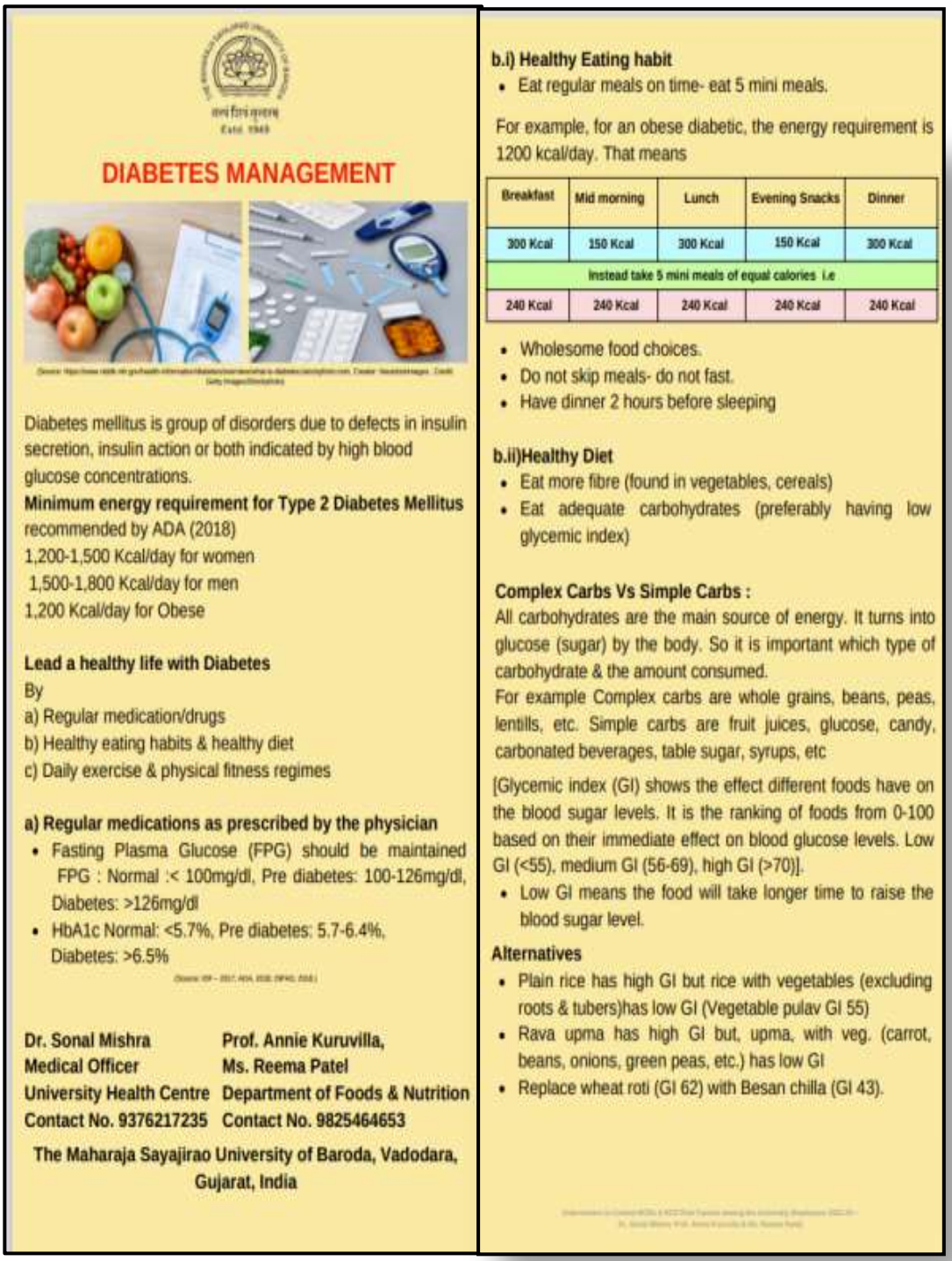
Phase III Post Survey of Biochemical parameters & Anthropometric Measurements & KAP

The post-test was done after 3 months after the completion of intervention. The biochemical parameters, anthropometric measurement & Knowledge, regarding NCDs and its risk factors, Attitude & Practice regarding substance abuse, dietary habits and physical activity & sedentary lifestyle were evaluated again.

Phase IV Statistical Analysis

The collected data was entered into the SPSS file (version 25.0) and then checked, cleaned and re-coded wherever needed. Descriptive statistics was used to demonstrate the socio-demographic factors and behavioural risk factors and comparative statistics (paired sample t-test) was used to demonstrate the significance of pre- and post-test differences in terms of the efficacy of the intervention.
Descriptive analysis: Socio-demographic data of the participants e.g. gender, type of employment, education status, family history of NCDs were analyzed. All categorical variables were summarized in frequency and percentages and continuous variables in mean and standard deviation. To estimate the association of these characteristics t-tests and chi-square tests were done.
Inferential analysis: To estimate the efficacy of the intervention, before-after data was analyzed and paired t-test and chi-square tests were done.
The findings of this research study would be disseminated in the form of a report and would be sent to concerned university authorities and university medical center for further perusal. This study would also help in creating evidences for future research or action-plan for better health for the university employees.

Fig: 3.2 Different Types of Brochures



DIABETES MANAGEMENT

Diabetes mellitus is group of disorders due to defects in insulin secretion, insulin action or both indicated by high blood glucose concentrations.

Minimum energy requirement for Type 2 Diabetes Mellitus recommended by ADA (2018)

1,200-1,500 Kcal/day for women

1,500-1,800 Kcal/day for men

1,200 Kcal/day for Obese

Lead a healthy life with Diabetes

By

a) Regular medication/drugs

b) Healthy eating habits & healthy diet

c) Daily exercise & physical fitness regimes

a) Regular medications as prescribed by the physician

- Fasting Plasma Glucose (FPG) should be maintained FPG : Normal :< 100mg/dl, Pre diabetes: 100-126mg/dl, Diabetes: >126mg/dl
- HbA1c Normal: <5.7%, Pre diabetes: 5.7-6.4%, Diabetes: >6.5%

Dr. Sonal Mishra
Medical Officer
University Health Centre
Contact No. 9376217235

Prof. Annie Kuruvilla,
Ms. Reema Patel
Department of Foods & Nutrition
Contact No. 9825464653

The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

b.i) Healthy Eating habit

- Eat regular meals on time- eat 5 mini meals.

For example, for an obese diabetic, the energy requirement is 1200 kcal/day. That means

Breakfast	Mid morning	Lunch	Evening Snacks	Dinner
300 Kcal	150 Kcal	300 Kcal	150 Kcal	300 Kcal
Instead take 5 mini meals of equal calories i.e				
240 Kcal	240 Kcal	240 Kcal	240 Kcal	240 Kcal

- Wholesome food choices.
- Do not skip meals- do not fast.
- Have dinner 2 hours before sleeping

b.ii)Healthy Diet

- Eat more fibre (found in vegetables, cereals)
- Eat adequate carbohydrates (preferably having low glycemic index)

Complex Carbs Vs Simple Carbs :

All carbohydrates are the main source of energy. It turns into glucose (sugar) by the body. So it is important which type of carbohydrate & the amount consumed.

For example Complex carbs are whole grains, beans, peas, lentills, etc. Simple carbs are fruit juices, glucose, candy, carbonated beverages, table sugar, syrups, etc

[Glycemic index (GI) shows the effect different foods have on the blood sugar levels. It is the ranking of foods from 0-100 based on their immediate effect on blood glucose levels. Low GI (<55), medium GI (56-69), high GI (>70)].

- Low GI means the food will take longer time to raise the blood sugar level.

Alternatives

- Plain rice has high GI but rice with vegetables (excluding roots & tubers)has low GI (Vegetable pulav GI 55)
- Rava upma has high GI but, upma, with veg. (carrot, beans, onions, green peas, etc.) has low GI
- Replace wheat roti (GI 62) with Besan chilla (GI 43).

Low GI:≤55	Medium GI: 56-69	High GI: ≥70
Fructose(15), Cashew nut(20), Walnut(15), Apple(36), Orange(43), Banana raw(51), Mango raw (51), Dates raw(42), Peaches(43), Strawberry(49), Apple juice(41), Orange juice(50), Coconut(42),Grapes(53), Kiwi(38), Pear(37), Guava(24), Custard apple(54), Carrot boiled(39), Vegetable soup(48), Capsicum(15), Tomato (15), Onion(10), Green peas(48), Spinach(15),peas(38), Cauliflower(30), Cabbage(10),Green, Broccoli(15), Plum(40), Kodari(54) beans(32),Mushroom(15), Cucumber(15), Lettuce(15), Chillies(15), Sweetcorn(52), Kidney beans(Rajmah(24),Lentils(32), Chickpeas(28), Soya beans(16),Green moong dal(38),Black eyed Bajara, Chapatti(52), Barley(28), .Bengal gram dal(28), Milk full fat(39), Milk skim(37), Soya milk (34), Porridge-rolled oats(55), Besan Chilla(43.65) Rice noodles(53), Yogurtfruit(41),Pasta(50) Multi grain bread(53), Corn tortilla(46), Spaghetti, white(49), Spaghetti, whole meal(48), Pongal with sambhar(53.6) .	Sucrose(65), Honey(61), Fig(61),Pineapple(59), Mango ripe(56), Banana ripe(62), Potato (French fries)(63), Sweet potato boiled(63), Wheat flakes biscuit(69), Muesli(57), Rice flakes, Uttapam(64), Methi thepla(60), Uttapam with chutney(63), Adai with chutney(69.6),.Vegetable cutlet(62) Semolina (Rava)(66), Popcorn (65), Soft drink/soda(59), Cheese pizza(60), Marconi& cheese(64) , South Indian meal(63.3), Curd rice with curry leaves chutney(65.4), Punjabi meal(68) Bisbele Bhat(58), Wheat roti(62), Brown rice boiled(68).	Glucose(103), Water melon(76), Potato boiled(78), Cornflakes (81), Instant oats porridge(79), Rice porridge/ Congee(78), Dosai with podi(91.3), Idli with chutney(101.5), Rava upma/dhokla, Hanadvo(90.), Muthiya(70), White wheat bread(75), Whole wheat bread(74), Puffed rice, White rice boiled(73),Rasam rice with papad (77.5), Gujarati meal(83), Sambhar rice(83.), Bengali meal(70).

[Source: Diabetes care, Vol 31, Number 12, December 2008] NATIONAL INSTITUTE OF NUTRITION Hyderabad, Second edition 2011]

3. Reduce intake of:

- High fat foods (fried foods, cream, butter, ghee, cheese, red meat
- Refined or simple carbohydrates like sugar, jams, jellies, honey, jaggery, chocolate, sweet dairy products, sago, arrowroot, roots & tuber like potato, yam, sweet potato, colocasia
- Refined flour preparations like biscuit, noodle, pasta and white bread, cakes, pastries, etc.

4. Include lean meats – fish, chicken, egg whites

5. Limit salt (less than one teaspoon i.e. 5gms a day) and sugar (visible sugar intake less than 2 tablespoons or 25 grams)

c) Physical Fitness

i. Walking for 30 minutes twice a day

ii. Stretching & muscle strengthening exercises, 15-20 minutes once a day.

iii. Maintain desirable body weight and avoid sedentary life style



Test for Diabetes

Blood Test

Random plasma Glucose Test- This measures the amount of glucose in the blood at any given time and is done without fasting. If there are symptoms of DM and the amount of glucose in the blood is 200 mg/day or higher, it will be diagnosed as having diabetes.

Fasting Plasma Glucose Test- This is measured after a fasting of at least 8 to 10 hours. Normally after fasting the amount of glucose is less than 100 mg/dl. But when the amount of glucose is greater than 126 mg/dl , it is diagnosed as diabetes.

Impaired Fasting Glucose- a condition diagnosed when oral glucose test results show blood glucose level falls between normal and diabetic levels. If the test results are greater than 110 mg/dl but less than 126 mg/dl on more than two occasions, it is diagnosed as impaired fasting glucose.

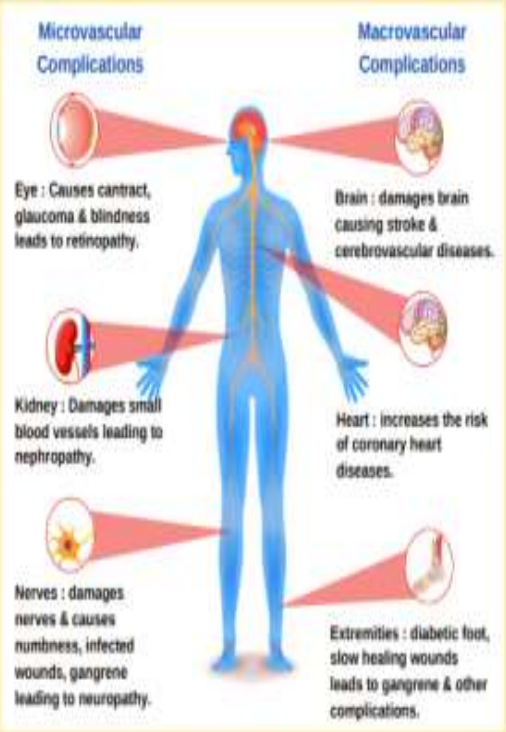
Glycosylated Hemoglobin (HbA1c)- Glucose attaches to the hemoglobin molecule in a one dash way reaction throughout the 120-day life of the red blood cell. This blood test is performed on a random blood sample.

For good glycemic control, the HbA1C should be <6.5%. The HbA1c value reflects the blood sugar level preceding 2 - 3 months and hence it is the best test for DM patients. HbA1c is recommended at least two times a year.

Urine Test- When blood glucose reaches 180-200 mg/ml, the kidneys begin to spill glucose into the urine. This point of spillage is called the renal threshold. This increases as the kidney function decreases.

(Source: Diabetes in Practice- A Handbook- Sunita Malhotra, Second Edition 2016)

Complications of uncontrolled diabetes



Frequently asked questions:

1. Can diabetes be reversed/ eliminated fully? No. It can be controlled by proper diet, drug & exercises.
2. What is HbA1c? It is an average reading of blood sugar of three months which reflects the diabetes status & preferably should be less than 6.5% for good diabetic control.
3. Should fruits be avoided because they are sweet? No. Fruits are healthy sources of carbs, essential nutrients, vitamins & minerals. Should be taken in moderation (according to their GI).
4. Can artificial sweeteners/sugar free be used without limit? Yes, there is a safe level of intake for each sweetener.
5. Which is the safest sweetener to use? Stevia because it is herbal (leaf extract) in comparison to other artificial sweeteners and contains negligible calories (two teaspoons of sugar contains 40 calories) & is heat stable (for hot beverages).

FDA approved Sweeteners	Accepted daily intake (ADI) (mg/kg body weight)
Sucralose	5 mg/kg body weight/day
Aspartame	50 mg/kg body weight/day
Acesulfame K (Contraindicated in hyperkalemia)	15 mg/kg body weight/day
Saccharin (Contraindicated in Pregnancy)	5 mg/kg body weight/day
Steviol glycosides	4 mg/kg body weight/day
Siraitia grosvenorii Swingle (Lue Han Guo) fruit extracts (SGFE)	Not Specified
Advantame	32.8 mg/kg body weight/day
Neotame	0.3 mg/kg body weight/day

(Source: Adapted from U.S Department of Health and Human Services (2015))

6. Should carbohydrates (carbs) be fully avoided? No, because carbs are the main source of energy & essential nutrients, so limited use is advised (choose complex carbs instead of simple carbs).
7. Is weight loss important for diabetics? Yes, maintaining proper body weight is important. Weight loss increases insulin sensitivity allowing cells to use insulin more effectively thereby improving blood sugar, blood pressure and cholesterol levels possibly leading to fewer medications or lower doses.
8. Can complications of diabetes be delayed/prevented? Yes, aggressively monitoring blood sugar, blood pressure and cholesterol levels, regular healthy diet & exercises will lead to healthier life & longevity without
9. diabetic complications.
   Is sugar present in the urine also, in diabetic? Yes, if sugar in the blood is more than 0.25mg/ml (glycosuria)
10. it appears in the urine.
    Is exercise/physical activity compulsory for diabetes? Yes, it helps to control blood sugar levels, lowers risk of heart diseases, nerve damage, raises good cholesterol (HDL), lowers bad cholesterol, and improves memory and better sleep.

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Hypertension & Cardio Care

(Photo: Freepik)

Heart diseases can be prevented / controlled by

a) Regular medication/drugs b) Healthy weight
c) Eating foods with low sodium d) Healthy diet
e) Exercise/physical fitness

a) Regular medication as prescribed by the physician

- Normal blood pressure should be maintained.

Catagiory	Systolic(mmHg)	Diastolic (mmHg)
Normal	Less than 120	Less than 80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	More than equal to 160	More than equal to 100

JNC 8 Classification of Hypertension, 2014

b) Healthy weight

Weight loss and maintaining steady weight are critical for prevention and control of heart diseases .

Energy requirement per day according to ideal body weight
Sedentary worker: 20 kcal/kg ; obese person: 1200kcal/kg

(Source: Dietetics, by Srilakshmi.B, 8th edition.2019)

Dr. Sonal Mishra
Medical Officer
University Health Centre
Contact No. 9376217235

Prof. Annie Kuruvilla,
Ms. Reema Patel
Department of Foods & Nutrition
Contact No. 9825464653

The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

Body Mass Index (BMI)

	BMI(Asia-pacific) kg/m2
Underweight	<18.5
Normal	18.5-22.9
Overweight	23-24.9
Obesity	>25

BMI is an assessment of body weight related to height and in most people correlates highly with body fat. It is determined by weight in kilograms divided by height in meters squared (kg/m2). **BMI = Weight (kg)/Height (m)^2**

LDL Cholesterol mg/dl	Cholesterol mg/dl	HDL Cholesterol mg/dl	Triglycerides mg/dl
Optimal: <100	Desirable: <200	High: >60	Normal: <150
Near Optimal: 100-129	Borderline High:200-239	Low: <40	Borderline High: 150-199
Borderline High: 130-159	High: >240		High: 200-499
High: 160-189			Very High: >500
Very High: >190			

HDL (good) Cholesterol – A healthy HDL level may protect against heart disease and stroke. Being overweight and sedentary can lower HDL cholesterol. Women tend to have higher levels of HDL cholesterol than men.
Triglycerides- A high triglyceride level combined with low HDL cholesterol or high LDL cholesterol is linked with fatty build-ups in artery walls. People with heart disease have high triglyceride levels.

c) Eating foods with low sodium

- Lowering salt intake corresponds to a reduction in high blood pressure (WHO).
- The daily recommended maximum intake in healthy adults is 5 grams or one level teaspoon of table salt.

Foods high in added salt:

- Pickles, chutneys, sauce and ketchup.(brine)
- Papads, chips and salted biscuits.(Sodium chloride)
- Bakery foods.(Sodium bicarbonate)
- Frozen foods.(Monosodium glutamate)
- Cheese and salted butter. (Sodium Propionate)
- Canned vegetables and preserved foods. (Sodium Benzoate)
- Canned foods. (sodium Citrate)
- Ready made soup packets (Sodium chloride)
- Dried salted fish (Sodium chloride)
- Dried fruits (Sodium Sulfite)

Extra sodium in our diets comes from:

75% during processing; 15% in cooking and at the table; 10% in foods naturally.

(Source: Dietetics in Practice- A Handbook- Sunita Malhotra; Second Edition: 2018)

d) Healthy Eating Habits

- **Saturated Fatty acids(SFA)** raise the levels of LDL(bad cholesterol) & total blood cholesterol & hence increases the risk of heart diseases.
- **Polyunsaturated fatty acids (PUFA)** decreases LDL & decreases the triglycerides and prevents thrombus formation.
- **Monounsaturated fatty acids (MUFA)** lowers LDL without lowering HDL cholesterol, do not raise triglycerides levels & are anti -inflammatory.
  SFA must be replaced by MUFA & PUFA.

PUFA has a greater (total) cholesterol lowering effect. But PUFA lowers HDL by 0.2 mg/dl and MUFA lowers HDL by only 0.1 mg/dl. Hence a combination of MUFA (10% of total energy) & PUFA(8-10%) should be used.

Note: Severe restriction of fat results in mental depression.

(Ref: Clinical Dietetics Manual, 2nd Edition 2018 by IDA.)

- Change the type of oil every three months.
- Use two different types of oils at a time.
- FAO and WHO recommend omega-6 to omega-3 fatty acid ratio to be between 4:1 and 10:1.
- Foods rich in omega-3 are cardio protective.

Source of MUFA, SFA, omega 3 and PUFA/omega 6 fats

SFA	MUFA	Omega-6/PUFA	Omega-3
Coconut oil	Olives	Safflower oil	Canola oil
Palm oil	Rapeseed	Sunflower oil	Linseed oil
Cocoa butter	Avocado	Corn oil	Soya oil
Whole milk	Nuts	Cotton seed oil	Flax seed
Egg yolk	Peanut oil	Sesame oil	Spinach
Meat	Olive oil	Soya Bean	Oil fish-tuna, salmon, etc.
	Canola oil	Walnut	
	Gingelly oil		

- Include lean meats – fish, chicken, egg whites
- Follow DASH (Dietary Approach to stop Hypertension) diet.
- Adequate potassium and calcium intake is needed for blood pressure control.

	Cholesterol mg/100 g edible portion	Food items	Cholesterol mg/100 g edible portion
Milk skim	2	Milk whole	14
Cheese spread	65	Mutton	65
Milk powder,whole	85		
Chicken with skin	100	Butter	250
Liver	300	Ghee	300
Egg whole	400	Egg yolk	1120

- Eat more fiber (found in vegetables, cereals), fresh fruits daily.
- Reduce intake of high fat foods (fried foods, cream, butter, ghee, cheese, red meat).
- Fat needed : 15-30% of total energy per day i.e 10 to 20 gram per day (1-1 ½ table spoon).

e) Exercise/physical fitness

i. Walking for 30 minutes twice a day

ii. Stretching & muscle strengthening exercise once a day.

iii. Maintain desirable body weight and avoid sedentary life style

Complications:

- Congestive Heart Failure
- Kidneys- high blood pressure can damage the small blood vessels in the kidneys leading to chronic kidney diseases (CKD).
- Eyes- blood vessels break and bleed in the eye and can result in blurred vision or even blindness
- Hypercholesterolemia or high cholesterol is due to abnormally high levels of fat in the blood. This is a risk for stroke & heart attacks and other heart problems.

Note :

- Atherosclerosis : is a condition where arteries get harder, narrower and blocked with fatty plaque.
- Stroke : is a condition blocking the flow of blood to the brain.

Source : JAMA Cardiology,Cleveland clinichttps://nephrotus.com/diabetic-kidney-disease-why-it-is-important/, Getty Images/iStockphoto,Photo: istock, medindia

DASH DIET :

The 'Dietary Approaches to stop Hypertension' (DASH) Diet is used for prevention and controlling hypertension.

Food Groups	Calories / Servings		Serving Sizes	Examples	Significance of each food group to the DASH eating plan
	1200	1400-1600			
Grains	4	5-6	1 slice bread,1 oz dry cereal, ½ cup cooked rice/pasta/cereal	Whole wheat bread, whole wheat pasta, cereals, oatmeal, brown rice, popcorn.	Major source of energy and fiber
Vegetables	2-3	3-4	1 cup raw leafy vegetable/ salad, ½ cup cut-up raw or cooked vegetable, ½ cup vegetable juice	Broccoli, carrots, green beans, green peas, lima beans, potatoes, spinach, sweet potatoes, tomatoes	Rich source of potassium, magnesium and fiber.
Fruits	3	4	1 medium fruit, ¼ cup dried fruit, ½ cup fresh, frozen or canned fruit, ½ cup fruit juice.	Apple, apricots, bananas, dates, oranges, raisins, grapefruit (juice), mangoes, melons, pineapples, strawberries,	Important source of potassium, magnesium and fiber
Fat-free or low fat milk and milk products	2	2-3	1 cup yoghurt or milk, 1 ½ oz (45g) cheese	Fat-free(skim) or buttermilk; reduced-fat cheese; fat-free or frozen yoghurt	Major source of calcium and protein
Lean meat, poultry & fish	2-3	3-4	90gm cooked meat, fish, poultry or 1 egg.	Select only lean; trim away visible fats; broil, roast or poach; remove skin from poultry	Rich source of protein and magnesium
Nuts, seeds and legumes	2 per week	3-4 per week	1/3 cup or 1 ½ oz (45gm) nuts, 2 tablespoon peanuts butter, 2 tablespoon or ½ oz seeds. ½ cup cooked legumes (dry beans and peas)	Almonds, mixed nuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils, split peas.	Rich source of energy, magnesium, protein and fiber
Fats and Oils	1	1-2	1 teaspoon vegetable oil, 1 teaspoon soft margarine, 1 tablespoon mayonnaise, 2 tablespoon salad dressing	Soft margarine, vegetable oil (such as canola, corn, olive or safflower), low-fat mayonnaise, light salad dressing.	The DASH study had 27 percent of calories as fat, including fat in or added to foods
Sweets and added sugar	2	3 or less per week	1 tablespoon sugar , jam or jelly, ½ cup sorbet, gelatin, 1 cup lemonade	Fruit- flavored gelatin, fruit punch, hard candy, jelly, maple syrup,	Sweets should be low in fat

(Source: nhlbi.nih.gov

Mind Your Weight

Obesity : is defined as abnormal or excessive fat accumulation that presents a risk to health and body

Obesity can be handled by

a) Healthy weight b)Healthy Eating Habits

c) Daily exercise/physical fitness regimes to remain physically active

a) Healthy weight

- Energy requirement for an obese person: 1200 kcal/day
- Obesity attracts disability, diseases and premature death. Excess body weight is a barrier leading to breathlessness on moderate exertion and predisposes a person to diseases like atherosclerosis, high blood pressure, stroke, diabetes etc.

Body Mass Index

	BMI(Asia-Pacific) kg/m2
Underweight	<18.5
Normal	18.5-22.9
Overweight	23-24.9
Obesity	>25

- Waist -Hip Ratio, Cutoff : Men: 0.96-1.00 & Women: 0.81-0.85
- Waist Circumference, Cutoffs : Men: <90 cm & Women: <80cm

Dr. Sonal Mishra
Medical Officer
University Health Centre
Contact No. 9376217235

Prof. Annie Kuruvilla,
Ms. Reema Patel
Department of Foods & Nutrition
Contact No. 9825464653

The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

b) Healthy Eating Habits

- Remove cream from milk-use skimmed milk.
- Use egg whites instead of whole egg.
- Take dinner 2 hrs. before sleep.
- Eat more fibre (found in vegetables, cereals), fresh fruits daily, whole grams & grains and other legumes. Sprouted grams are nutrient dense.
- Plenty of colourful fruits and vegetables should be included in the diet. Green leafy vegetables should be part of every meal.
- Reduce intake of high fat foods (fried foods, cream, butter, ghee, cheese, red meat etc).
- Include lean meats – fish, chicken, egg whites.
- Reduce the intake of high sodium (salt less than one teaspoon i.e. 5gms a day) & salted foods(baking powder, canned and preserved foods, salted nuts, salted pickles, papad, chips,etc).

Eat Right India – Aaj se Thoda kam

- "Aaje se thoda kam" campaign brought out by FSSAI in all social media aims to promote less usage of salt, sugar & fat.
- Salt is the main source of sodium in our diet.
- High sodium is a risk factor for high blood pressure, which leads to heart problems.
- The average Indian consumes nearly double the recommended amount of salt every day.

Tips to reduce salt consumption :

- Gradually reduce the use of salt in daily diet.
- Cut in half the amount of high sodium and salted seasonings used in food preparation (baking powder, canned and preserved foods, salted nuts, salted pickles, papad, chips, etc.)
- Drink plenty of water every day to flush out toxins and excess of sodium from the body.
- Eat fruits and vegetables, which are rich in potassium to neutralize the effect of sodium in the body.
- Do not add salt to rice or to atta while cooking chapattis.

CHEENI KAM

High intake of sugar is a risk factor for obesity and can lead to diabetes and other diet-related non-communicable diseases.

Tips to reduce sugar consumption:

- Use naturally available sweet ingredients rather than refined sugar. For example, in fruit-based desserts add more fruits for natural sweetness.
- Limit the intake of cakes, pastries, confectioneries and sweets prepared with refined cereals containing high amounts of sugar.
- Limit the consumption of sugar-sweetened beverages and sugary snacks.
- Instead of drinking fruit juice, eat fresh whole fruits. It provides fiber, which gives a feeling of fullness and fewer calories.
- Limit the amount of desserts and use less sugar in preparing them.
- Substitute sugar with jaggery.

GHEE-TEL KAM

Excess of fat intake is a risk factor for obesity and non-communicable disease like diabetes and heart diseases.

Tips to reduce fat consumption:

- Gradually reduce the use of oil in daily diet.
- Measure cooking oil with small spoon rather than pouring freely from the bottle.
- Change the type of oil every three months and use two different types of oils at a time
- Do not repeatedly reheat oil or re-use the same oil for frying or cooking.
- Avoid frying as much as possible. Instead boil, steam, roast or grill food.
- Moderate consumption of high fat foods such as biscuits, khari, puffs, cookies, nankhattai, samosa, etc.
- Choose lean meat source like chicken or fish instead of red meat or organ meat.

c) Exercise/physical fitness regimes to remain physically active

Achieving a healthy body weight by appropriate diet and physical activity holds the key to a healthy lifestyle. Daily exercise of 60 minutes or more is advised for weight loss.

Keep yourself fit by :

i. Walking 30 minutes twice a day.

ii. Stretching & muscle strengthening exercises once a day.

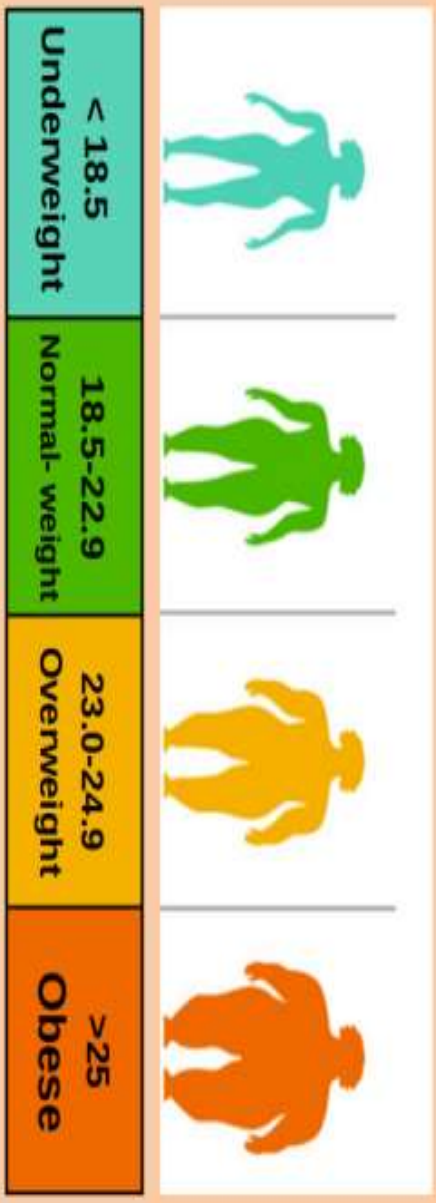
iii. Maintaining desirable body weight and avoiding sedentary life style.

Obesity Complications:

- High blood pressure
- Heart disease
- High cholesterol levels
- Diabetes
- Cancer
- Arthritis

Reduce/Limit :

- Sweetened beverages like cold drinks
- Processed foods
- Preserved and canned food items like jams, jellies, canned soups, etc.
- Bakery products like cake, khari, breads, puff, etc.



Sr. No.	Types	Time (Minuts)	Calories burnt
1	Streaching/Yoga streaching	20	39
2	Weight lifting	20	103
3	Fast Running	20	62
4	Moderate walking	20	58
5	Jogging	20	197
6	Bicycling/Slow running	20	120
7	Moderate running(Treadmill)	20	419
8	Free style swimming	20	100
9	Free style swimming(Vigorous)	20	168

Source : National Institute of Nutrition, (ICNR) Hyderabad, India

[Intervention to Control NCDs & NCD Risk Factors among the University Employees 2022-23:- Dr. Sonal Mishra, Prof. Annie Kurunthe & Ms. Reema Patel]

Estd. 1949

HEALTHY DIET FOR HEALTHY LIVING

(Photo: Freepik)

Lead a healthy life by

a) Healthy Eating Habits

b) Daily exercise/physical fitness regimes

a) Health Eating Habits

- Eat more vegetables (350 gm) and fruits (150 gm)daily (excluding potatoes, sweet potatoes and other starchy roots).
- Swap refined grains including foods made with maida with whole grains, cereals and millets like sorghum(jowar), pear millet (bajra), finger millet (ragi), foxtail millet (Kodari) etc.
- Use dal and pulses like kidney beans, chickpea, green gram etc.
- Consume low-fat(skimmed) milk and milk products like curd, buttermilk and cottage cheese (paneer).
- Choose low GI fruits and vegetables & vegetable greens
- Take handful of mixed nuts (Almonds, walnuts, pistachios, etc.) replacing one cereal exchange(20gm).
- Fat consumption should be less than 20% of total energy intake . Unsaturated fats (found in fish, flax seeds avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard). Avoid trans-fats of all kinds.

Dr. Sonal Mishra
Medical Officer
University Health Centre
Contact No. 9376217235

Prof. Annie Kuruvilla,
Ms. Reema Patel
Department of Foods & Nutrition
Contact No. 9825464653

The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

- Use less than 5 g of salt (equivalent to about one teaspoon) intake per day.
- Use less than 5% of total energy intake from free sugars, which is equivalent to 25 g (about 6 teaspoons) per day.

MY Plate Concept

My plate for day represents proportion of different food groups for meeting - 2000Kcal

Source: My plate, National Institute of Nutrition, ICMR, India 2010

My plate modification for different energy requirement:

Sr. No.	Item	1200 Kcal	1500 Kcal	1800 Kcal
1	Vegetables	210 gms	262.5 gms	315 gms
2	Fruits	90gms	112.5 gms	135 gms
3	pulses	54 gms	67.5 gms	81 gms
4	Nuts	18 gms	22.5 gms	27 gms
5	Fats & Oils	16.2 gms	20.25 gms	24.3 gms
6	Cereals	144 gms	180 gms	216 gms
7	Milk/Curd	180 ml	225 ml	270 ml

Role of Functional Foods in Preventing NCDs

Functional foods have active compounds like vitamins, probiotics, antioxidants, fibers, etc. that support health and help to prevent various diseases

Herb/Spice	Gujarati Name	Health Benefit
Fenugreek seeds	Methi	Improves blood sugar levels, reduces cholesterol, has anti-inflammatory effects and controls appetite.
Garlic	Lasun	Keeps blood vessels flexible, helps to reduce cholesterol and triglyceride levels.
Turmeric	Haldi	Helps to reduce inflammation and improves heart health.
Cumin	Jeeru	Aids in digestion, lowers blood sugar levels, increases insulin sensitivity, protects against heart diseases.
Coriander	Dhana	Helps to lower blood pressure, blood sugar levels and cholesterol levels.
Cinnamon	Dalchini	Helps to reduce cholesterol level and lowers blood sugar levels.
Cardamom	Elaichi	Lowers blood pressure, improves breathing and helps to heal stomach ulcers.
Basil	Tulsi	Protects against cancers, regulates blood sugar levels, lower cholesterol and triglycerides.
Ashwagandha	Ashwagandha	Lowers blood sugar levels, manages stress & lowers anxiety.
Cloves	Laung	High in antioxidants, protects against cancers ,helps in regulating blood sugar and promotes good bone health.
Dry Ginger	Sonth	Helps in weight loss and indigestion, lowers blood sugar levels and cholesterol and improves metabolism.
Flax Seeds	Alsi	Improves digestion, reduces risk of heart diseases, diabetes and cancers.
Garden Cress Seeds	Asadiyo	Rich in iron and fiber, helps in weight loss, lowers blood sugar levels and boost immunity.
Chia seeds	Chia seeds	Rich in antioxidants and fiber, lowers blood sugar levels and risk of heart diseases, helps with weight loss and is good for bone health.

[Intervention to Control NCDs & NCD Risk Factors among the University Employees 2022-23 - Dr. Sonal Mishra, Prof. Annie Kuruvilla & Ms. Reema Patel]

b) Daily exercise/physical fitness regimes

Daily physical activity improves health, fitness and quality of life, hence decreases the risk of cancer, stroke, and heart diseases and also helps to treat obesity, depression and diabetes.

It also helps in losing and maintaining weight.

i. Walking for 30 minutes twice a day

ii. Stretching & muscle strengthening exercises, 15-20 minutes once a day.

iii. Maintain desirable body weight and avoid sedentary life style

(Photo: Shutterstock Images)

Energy content of common Fruits

Sr. No.	Item	Quantity/Size	Weight (gms)	Calories
1	Banana	1 no	101	117
2	Orange	1 no	184	88
3	Custard Apple	1 no	170	160
4	Papaya	1 Piece	145	46
5	Chickoo	1 Cup	241	236
6	Pomegranate	1 Cup	174	144
7	Water melon	1 Cup	154	25
8	Pineapple	1 Cup	165	76
9	Grapes	1 Cup	151	107

(Source: Physician Practice.com)

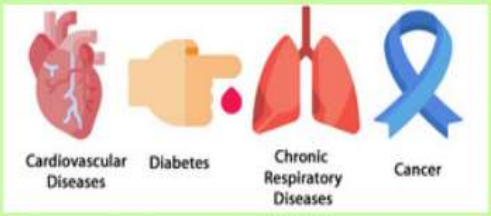
Energy content of common foods

Sr. No.	Item	Quantity/Size Cup	Weight (gms)	Calories
1	Cabbage	1	100	62
2	LadyFinger/Giloda	1	100	68
3	Cauliflower	1	100	81
4	Dudhi (Bottle Gourd)	1	100	50
5	Suran (Yam)	1	100	90
6	Sev-Tomato	1	130	149
7	Brinjal & Potato	1	100	81
8	Tuvar dal	1	150	116
9	Gujarati Sweet Kadhi	1	150	69

Source : National Institute of Nutrition, (ICNR) Hyderabad, India

HOW TO OVERCOME BARRIERS TO HEALTHY DIET

- Identify the barrier to an unhealthy diet and work on them
- When planning a daily meal choose seasonal and locally available food so that the cost can be reduced
- Whenever there is stress, try and engage in some kind of relaxation or physical activity or even talk to someone instead of over-eating or under -eating .
- Understand that unhealthy diets lead to NCDs and other health problems.



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Benefits of Healthy Diet

- It protects against many chronic non communicable diseases, such as heart diseases, diabetes and cancers.
- People consuming diets rich in vegetables and fruits have significantly lower risk of obesity, heart diseases, stroke, diabetes and certain types of cancers.
- Using unsaturated vegetable oils (olive, soy, sunflower or corn oil) rather than animal fats or oils high in saturated fats (butter, ghee, lard, coconut and palm oil) is a healthier option.
- Keeping the salt intake to less than 5gm per day helps prevent hypertension and reduces the risk of heart diseases and stroke in the adult population.
- Maintaining a healthy weight and eating a balanced diet that is low in saturated fat and high in fibre found in whole grains can help to reduce the risk of developing type 2 diabetes.
- A healthy diet rich in fruits, vegetables, whole grains and low-fat dairy can help to reduce the risk of heart diseases by maintaining blood pressure and cholesterol levels.

Fig: 3.3 Small groups Meeting

Results and Discussion

RESULTS AND DISCUSSIONS

Majority of the non-communicable diseases (NCDs) can be prevented by managing behavioural risk factors such as **unhealthy eating, tobacco use, physically inactive, obesity and heavy use of alcohol (WHO,2021).**

Behavioral risk factors like excessive dietary salt intake, physical inactivity, unhealthy diet, tobacco use, and harmful use of alcohol lead to metabolic risk factors like obesity, hyperlipidaemia, and hyperglycaemia and raised blood pressure. Significant proportion of global deaths are due to these modifiable behavioral risk factors (GBD, 2015).

In order to prevent and control major NCDs, the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was launched in 2010 with focus on strengthening infrastructure, human resource development, health promotion, early diagnosis, management and referral.

As on March 2016, NPCDCS was under implementation in all 36 States/UTs. A total of 298 District NCD Cells and 293 District NCD Clinics have been established in the country.

The modified strategies of the programme are as follows: (NHM, 2022: https://nhm.gov.in/)

1. **Health promotion through behavior change with involvement of community, civil society, community based organizations, media etc.**
2. Outreach Camps are envisaged for opportunistic screening at all levels in the health care delivery system from sub-centre and above for early detection of diabetes, hypertension and common cancers.
3. Management of chronic Non-Communicable diseases, especially Cancer, Diabetes, CVDs and Stroke through early diagnosis, treatment and follow up through setting up of NCD clinics.
4. Build capacity at various levels of health care for prevention, early diagnosis, treatment, IEC/BCC, operational research and rehabilitation.
5. Provide support for diagnosis and cost effective treatment at primary, secondary and tertiary levels of health care.

6. Provide support for development of database of NCDs through a robust Surveillance System and to monitor NCD morbidity, mortality and risk factors.

   Under the recent initiative of NPCDCS, pilot project on 'Integration of AYUSH with NPCDCS' has been initiated in six districts in the country. AYUSH facilities and methodologies are being integrated with NPCDCS services for prevention and management of common NCDs, wherein the practice of Yoga is an integral part of the intervention.

The Ayushman Bharat programme was launched in 2018 to address health issues at all levels – primary, secondary, and tertiary. It has two components:

1. Pradhan Mantri Jan Arogya Yojana (PM-JAY), earlier known as the National Health Protection Scheme (NHPS).
2. Health and Wellness Centres (HWCs) - HWCs are being created by converting the existing primary health centres and sub centres. They provide comprehensive primary health care (CPHC) including a child and maternal health services, non-communicable diseases, and also diagnostic services, and free essential drugs.

Service offered by HWCs: (HWC, 2022:https://ab-hwc.nhp.gov.in/home/aboutus**)**

- Care in pregnancy and child –birth
- Neonatal and infant health care services.
- Childhood and adolescent health care services.
- Family planning, Contraceptive services and other Reproductive Health Care Services.
- Management of communicable diseases including National Health Programmes.
- Management of Common Communicable Diseases and Outpatient care for acute simple illnesses and minor ailments.
- **Screening, Prevention, Control and Management of Non-Communicable diseases**
- Care for Common Ophthalmic and ENT problems
- Basic Oral health care
- Elderly and Palliative health care services

- Emergency Medical Services
- Screening and Basic management of Mental health ailments

HWCs are important because they offer CPHC that is critical to enhancing health outcomes. Primary healthcare plays a vital role in preventing many disease conditions. Providing CPHC decreases morbidity and mortality at a lower cost and greatly reduces the requirement for secondary and tertiary care.

This study was taken up in view of accomplishing the objectives of NPCDCS & AYUSH in an institutional set up with the broad objective 'Intervention to control Non-communicable Diseases (NCDs) & its risk factors among University Employees'.

The specific objectives were as follows:

1. To assess the health of the university employees (pre-screening for biochemical parameters & anthropometric measurements).
2. To conduct a baseline survey to evaluate the knowledge on non-communicable diseases, namely, diabetes, cardiovascular diseases (CVDs), cancer & chronic respiratory diseases (CRD).
3. To conduct a baseline survey to evaluate the knowledge, attitude and practices about NCD risk behaviours such as unhealthy diet, physical inactivity, substance abuse etc. among the respondents.
4. To develop a health education intervention based on the baseline survey on NCDs & NCD related behavioural risk factors among the university employees.
5. To apply the health education intervention to the target group through effective communication approach and tools.
6. To conduct post interventional survey for biochemical parameters & anthropometric measurements.
7. To conduct a post interventional survey with the same questionnaire used in baseline data collection for evaluating knowledge, attitude & practices related to NCDs & its risk factors.
8. To evaluate the intervention by comparing pre and post intervention data.

Section-1

Objectives 1, 2 & 3 will be dealt with in this section.

Table: 4.1 Socio Demography of Employees

Background Characteristics		N	%
Sex	Male	80	**67.2**
	Female	39	32.8
Type of Employment	Teaching	36	30.3
	Non-Teaching	83	**69.7**
Mode of Employment	Temporary	57	47.9
	Permanent	62	52.1
Marital status	Married	103	**86.6**
	Unmarried	16	13.4
Education	Primary	5	4.2
	Secondary	5	4.2
	SSC	10	8.4
	HSC	8	6.7
	Graduation/post-graduation	56	**47.1**
	More than post-graduation	35	**29.4**
Number of family members	<5	76	**63.9**
	5 & above	43	36.1
History of family members 0n Chronic Diseases	No	49	41.2
	Yes	70	**58.8**
Age Groups	< 35 Years	11	9.2
	35-44 Years	34	28.6
	45-54 Years	48	**40.3**
	55 & above	26	21.8

Out of 119 participants in the study, **67 % were males, 70 % were non-teaching university employees and 86 % were married.** The qualification of the employees ranged from primary to Ph.D. with **73% graduates, post graduates and above**. Majority of the families had members less than 5**. More than half (59%) of the employees had a family history of NCDs (Table 4.1)**. The mean age of the study population **was 47.0±8.8 years (Table: 4.2).**

Table: 4.2 Mean Value of all the parameters

Variable Characteristics	Observation (N)	Mean	Std. Deviation	Minimum	Maximum
Age Of the Respondents (In Years)	119	47.08	8.803	22	61
Height (In Centimetres)	119	163.14	9.286	137	182
Weight (In kilograms)	119	71.43	12.701	50	103
BMI Score	119	**26.5602**	**4.41913**	17.23	38.00
Waist circumference (In Centimetres)	119	96.68	11.474	71	157
Hip circumference (In Centimetres)	119	102.21	11.408	34	135
WHR Score (In Centimetres)	119	0.9555	0.15717	0.73	2.38
WHR Score for Male	80	**0.9709**	**0.17878**	0.80	2.38
WHR Score for Female	39	**0.9241**	**0.09355**	0.73	1.20
Systolic Blood Pressure (mmHg)	119	**139.56**	**18.757**	92	218
Diastolic BP (mmHg)	119	**84.69**	**11.819**	44	115
Total Cholesterol (mg/dl)	111	**176.21**	**36.714**	108	281

Triglyceride (mg/dl)	112	**130.51**	**59.487**	50	410
HDL-C (mg/dl)	110	**48.25**	**10.712**	30	80
LDL- C(mg/dl)	110	**100.984**	**32.3785**	39.2	189.4
VLDL (mg/dl)	110	26.199	12.1311	10.0	82.0
CHO/HDL-Ratio	110	3.749	0.8443	2.1	6.0
LDL/HDL-Ratio	107	2.232	0.7324	0.8	4.5
Fasting Plasma Glucose (mg/dl)	117	**119.21**	**37.681**	72	293
HbA1c (%)	112	**6.146**	**1.4363**	4.0	11.3
Knowledge/Attitude Score (In percentage)					
NCD	119	51.51	20.937	0	100
Diabetes	119	57.31	22.890	0	100
Heart Disease	119	44.08	26.084	0	97
Cancer	119	46.17	29.440	0	100
Respiratory	119	38.78	32.212	0	100
Obesity	119	32.28	25.320	0	92
Physical Activity	119	39.03	26.472	0	91
Healthy Diet	119	38.14	28.195	0	96
Overall NCDs and Risk Factors	119	40.5269	22.70773	0.00	88.50

Table 4.2 gives the descriptive statistics of the study population. The mean BMI was **26.5±4.4 kgm^2.** The mean WHR of males and females were **0.97±0.18 & 0.92±0.09** respectively. The mean systolic and diastolic blood pressure was 1**39.5 ±18.7 mmHg & 84.7±11.8 mmHg** respectively. The mean value of total cholesterol was **176.2±36.7 mg/dl** and maximum was **281 mg/dl**. The maximum triglyceride value was 410 mg/dl, with mean of 130.51±59.8 mg/dl. The mean HDL-C was **48.25±11.8 mg/dl,** with maximum of 80 mg/dl, whereas the mean LDL-C was **100.98±32.3**

mg/dl, with maximum of 189mg/dl. The maximum fasting plasma glucose (FPG) was 293 mg/dl with mean value of **119.21±37.6** mg/dl and the mean value of HbA1c was **6.14±1.43 %**, with maximum of **11.3 %.** The mean knowledge scores of the university employees on different topics of NCDS ranged from **32% to 57%,** with overall knowledge score on NCDs and its risk factors being **40%.**

Table: 4.3(a) Nutritional status and Blood pressure measurements of University Employees

Group Statistics		N	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Age Of the Respondents (In Years)	Male	80	47.2	9.4	1.1	0.221	0.826
	Female	39	46.85	7.5	1.2		
Height (In Centimetres)	Male	80	167.03	7.6	0.8	8.285	0
	Female	39	155.18	7.2	1.2		
Weight (In kilograms)	Male	80	73.51	12.8	1.4	2.73	0.008
	Female	39	67.15	11.5	1.8		
BMI Score	Male	80	26.11	4.3	0.5	-1.545	0.127
	Female	39	27.48	4.6	0.7		
Waist circumference (In Centimetres)	Male	80	97.61	11.5	1.3	1.279	0.205
	Female	39	94.77	11.3	1.8		
Hip circumference (In Centimetres)	Male	80	101.88	11.8	1.3	-0.475	0.636
	Female	39	102.9	10.6	1.7		
Waist Hip	Male	80	0.9709	0.2	0	1.873	0.064

ratio	Female	39	0.9241	0.1	0		
Systolic BP (mmHg)	Male	80	140.93	18.4	2.1	1.114	0.269
	Female	39	136.77	19.4	3.1		
Diastolic BP (mmHg)	Male	80	85.18	12.4	1.4	0.678	0.5
	Female	39	83.69	10.6	1.7		

Table: 4.3(a) gives a comparative statistics of anthropometric data between male and female employees.

It was seen that the mean BMI in both males and females was **26.11±4.3 kg/ m^2 & 27.4±84.6** kg/ m^2 respectively, (according to Asia Pacific Standards of BMI, over weight is 23 to 24.9 kg /m^2) showing a trend towards over weight. The mean waist circumference of males **(97.61±11.5 cm)** and females **(94.77±11.3)** was high (cut-off s for WC for man < 90cm; women <80cm). Then mean WHR in males and females was **0.97±0.2 & 0.92±0.1.** The mean systolic blood pressure was **140.93±18.4 mmHg & 136.77±19.4 mmHg** in males and females respectively and the mean diastolic blood pressure was **85.1±12.4 mmHg & 83.7±10.5 mmHg** in males and females respectively. **These results show that the risk factors of NCDs were very much existing in the study population with respect to BMI & blood pressure.**

Table: 4.3(b) Clinical Data of university employees

Group Statistics		N	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Total Cholesterol (mg/dl)	Male	73	**173.56**	**33.6**	3.9	-0.981	0.33
	Female	38	**181.29**	**42.1**	6.8		
Triglyceride (mg/dl)	Male	74	**136.93**	**65**	7.6	1.799	0.075
	Female	38	**118**	**45.1**	7.3		
HDL-C (mg/dl)	Male	73	**46.22**	**9.4**	1.1	-2.652	0.01
	Female	37	**52.24**	**12.1**	2		

LDL-C(mg/dl)	Male	73	99.019	31.8	3.7	-0.877	0.383
	Female	37	104.859	33.6	5.5		
VLDL(mg/dl)	Male	73	27.834	13.3	1.6	2.306	0.023
	Female	37	22.973	8.6	1.4		
CHO/HDL-Ratio	Male	73	3.864	0.9	0.1	2.198	0.031
	Female	37	3.522	0.7	0.1		
LDL/HDL-Ratio	Male	73	2.285	0.8	0.1	1.169	0.246
	Female	34	2.118	0.7	0.1		
Fasting Plasma Glucose(mg/dl)	Male	80	**120.05**	**41.8**	4.7	0.41	0.683
	Female	37	**117.41**	**27**	4.4		
HbA1c (%)	Male	75	**6.261**	**1.5**	0.2	1.328	0.187
	Female	37	**5.914**	**1.2**	0.2		

The mean value of total cholesterol in females **(181.3±42.0 mg/dl)** was higher than males **(173.5±33.6 mg/dl),** whereas the mean value of triglycerides in males **(136.9±65 mg/dl)** was higher than in females **(118±45.1mg/dl).**The mean value of LDL-Cholesterol was also higher in females than in males, but the mean level of HDL-cholesterol was also higher in females **(52±12.1 mg/dl)** than in males **(46±9.4 mg/dl).**

Total cholesterol, LDL were higher in females whereas triglycerides was higher in males.

The mean value of fasting plasma glucose was **120.0±42 mg/dl** in males and **117.41±27 mg/dl** in females and HbA1c was **6.2±1.5%** in males and **5.9 ±1.2 %** females **(Table: 4.3 b)**.

Table: 4.3(c) Group Statistics about Knowledge and Attitude of University Employees

Group Statistics		N	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
NCD	Male	80	45.5	18.7	2.1	-4.784	0
	Female	39	63.85	20.1	3.2		
Diabetes	Male	80	52.45	23.3	2.6	-3.732	0
	Female	39	**67.27**	18.7	3		
Heart Disease	Male	80	37.99	23.5	2.6	-3.679	0
	Female	39	56.56	26.9	4.3		
Cancer	Male	80	40.33	26.7	3	-3.042	0.003
	Female	39	58.16	31.5	5		
Respiratory	Male	80	32.15	29.1	3.3	-3.171	0.002
	Female	39	52.38	34.3	5.5		
Obesity	Male	80	**27.6**	22.8	2.5	-2.788	0.007
	Female	39	41.88	27.7	4.4		
Physical Activity	Male	80	34.31	25.7	2.9	-2.868	0.005
	Female	39	48.72	25.7	4.1		
Healthy Diet	Male	80	32.03	26.4	3	-3.482	0.001
	Female	39	50.68	27.9	4.5		
Total	Male	80	35.2038	20.8	2.3	-3.758	0
	Female	39	51.4462	22.7	3.6		

From the Table: 4.3 (C) it was seen that females had better knowledge on all NCDs related topics compared to their counter parts and it was statistically significant. The knowledge was better in females than males and their highest knowledge was regarding diabetes. Knowledge about obesity was the least and it was in males.

Table: 4.4 Distribution of Anthropometrics & Clinical Characteristics among NCDs respondents

Anthropometry & Clinical Characteristics		Male		Female		Total	
		N	%	N	%	N	%
Nutrition Status	Underweight	2	2.5	0	0.0	2	1.7
	Normal	19	23.8	7	17.9	26	21.8
	Overweight	10	12.5	5	12.8	15	12.6
	Obese	49	**61.3**	27	**69.2**	76	**63.9**
	Total	80	100.0	39	100.0	119	100.0
WHR	Unhealthy	12	**15.0**	32	**82.1**	44	37.0
	Healthy	68	85.0	7	17.9	75	63.0
	Total	80	100.0	39	100.0	119	100.0
WC	Unhealthy	62	**77.5**	36	**92.3**	98	**82.4**
	Healthy	18	22.5	3	7.7	21	17.6
	Total	80	100.0	39	100.0	80	100.0
Blood Pressure	Optimal	8	10.0	6	15.4	14	11.8
	Near Optimal	36	45.0	17	43.6	53	44.5
	Borderline High	24	30.0	12	30.8	36	**30.3**
	High	12	15.0	4	10.3	16	**13.4**
	Total	80	100.0	39	100.0	119	100.0
Triglycerides	Normal	53	71.6	30	78.9	83	74.1
	Borderline High	10	13.5	5	13.2	15	13.4
	High	11	**14.9**	3	7.9	14	**12.5**
	Total	74	100.0	38	100.0	112	100.0
HDL Cholesterol	High risk	4	5.5	2	5.4	6	5.5
	Desirable	64	87.7	24	64.9	88	80.0
	Low risk	5	6.8	11	29.7	16	14.5
	Total	73	100.0	37	100.0	110	100.0
LDL Cholesterol	Optimal	37	51.4	21	56.8	58	53.2
	Near Optimal	19	26.4	7	18.9	26	23.9
	Borderline High	15	20.8	6	16.2	21	19.3
	High	1	1.4	3	8.1	4	3.7

	Total	72	100.0	37	100.0	109	100.0
Cholesterol	Desirable	57	78.1	28	73.7	85	76.6
	Borderline High	14	19.2	7	18.4	21	18.9
	High	2	**2.7**	3	**7.9**	5	4.5
	Total	73	100.0	38	100.0	111	100.0
Fasting Plasma Glucose	Normal	20	25.0	7	18.9	27	23.1
	Pre diabetes	42	52.5	21	56.8	63	**53.8**
	Diabetes	18	22.5	9	24.3	27	**23.1**
	Total	80	100.0	37	100.0	117	100.0
HbA1c	Normal	39	52.0	21	56.8	60	53.6
	Pre diabetes	14	18.7	6	16.2	20	**17.9**
	Diabetes	22	29.3	10	27.0	32	**28.6**
	Total	75	100.0	37	100.0	112	100.0

In the study population, 64 % were obese, 82 % had abdominal obesity (high WC). It was seen that the prevalence of obesity in females (69%) was more than males (61%). Similar result was seen for WHR (females 82%; males 15%) and WC (females 92%; males 77%). Since high value of WHR and WC are indicators of **abdominal obesity, it was seen to be more in females; hence, females are at higher risk for NCDs. 13% of the study population were having high blood pressure (stage 2 hypertension: ≥160 mmHg/≥100mmHg) & high triglyceride values (200-499 mg/dl).30 % were in stage 1 of hypertension (140-159mmHg/90-99mmHg).**

Triglycerides were higher in males (15%), whereas, LDL-C and total cholesterol were higher in females (8.1%; 7.9% respectively).

54 % were pre diabetic, 23% were diabetic with respect to fasting plasma glucose and 18% were pre diabetic and 29% were diabetic (Table: 4.4) with respect to HbA1c (HbA1c is a better indicator for validating diabetes). Elevated blood glucose is responsible for around 20% of cardiovascular fatalities (WHO 2022).

Table: 4.5 Knowledge and Attitude on NCDs among employees.

		Male		Female		Total	
		N	%	N	%	N	%
Knowledge on NCDs	Very Poor	11	13.8	2	5.1	13	10.9
	Poor	46	57.5	9	23.1	55	46.2
	Average	21	26.3	15	38.5	36	30.3
	Good	2	2.5	13	**33.3**	15	**12.6**
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Diabetes	Very Poor	11	13.8	1	2.6	12	10.1
	Poor	23	28.8	6	15.4	29	24.4
	Average	33	41.3	19	**48.7**	52	**43.7**
	Good	13	16.3	13	33.3	26	21.8
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Cancer	Very Poor	24	30.0	7	17.9	31	26.1
	Poor	21	26.3	7	17.9	28	23.5
	Average	29	36.3	11	28.2	40	33.6
	Good	6	7.5	14	**35.9**	20	**16.8**
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Respiratory Diseases	Very Poor	31	38.8	8	20.5	39	32.8
	Poor	28	35.0	10	25.6	38	31.9
	Average	14	17.5	9	23.1	23	19.3
	Good	7	8.8	12	30.8	19	**16.0**
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Obesity	Very Poor	35	43.8	11	28.2	46	**38.7**
	Poor	38	47.5	17	43.6	55	**46.2**
	Average	6	7.5	5	12.8	11	9.2

	Good	1	1.3	6	15.4	7	5.9
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Heart Disease	Very Poor	26	32.5	6	15.4	32	**26.9**
	Poor	27	33.8	11	28.2	38	**31.9**
	Average	23	28.8	8	20.5	31	26.1
	Good	4	5.0	14	35.9	18	15.1
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Physical Activity	Very Poor	29	36.3	6	15.4	35	29.4
	Poor	29	36.3	12	30.8	41	34.5
	Average	18	22.5	15	38.5	33	27.7
	Good	4	5.0	6	**15.4**	10	**8.4**
	Total	80	100.0	39	100.0	119	100.0
Knowledge on Healthy Diet	Very Poor	31	38.8	7	17.9	38	**31.9**
	Poor	24	30.0	10	25.6	34	28.6
	Average	23	28.8	14	35.9	37	31.1
	Good	2	2.5	8	**20.5**	10	8.4
	Total	80	100.0	39	100.0	119	100.0
Overall Knowledge on NCDs and Its Risk	Very Poor	27	33.8	6	15.4	33	27.7
	Poor	30	37.5	10	25.6	40	33.6
	Average	22	27.5	18	46.2	40	33.6
	Good	1	1.3	5	12.8	6	5.0
	Total	80	100.0	39	100.0	119	100.0

Note: Very poor = <25% score, poor =25-50%, Average =51-75% score, Good >75%

Only **13%** of the subjects had good knowledge on NCDs, with women (33%) knowing more than men (2.5%). Diabetes knowledge was found to be average in **44%** of the population, with females (48%) having better knowledge **(Table 4.5)**.

Only 16.8% had good knowledge on cancer, with females having more knowledge than males. Even knowledge about respiratory diseases was very low **(16%).38.7% and 46% of the total population had very poor and poor knowledge on obesity respectively.**

59% had poor knowledge about heart diseases and only 8.4% had good knowledge regarding physical activity, out of which females **(15%)** had better knowledge than males. However, it was seen that 32% had very poor knowledge on healthy diets, and only 20% of females had good knowledge on healthy diets **(Fig 4.2)**.

The Health Care Workers in Primary Health Care facilities in rural and urban local government areas of Osun State, Nigeria, had poor knowledge regarding the prevention and control of NCDs and training and re-training using relevant WHO-NCD protocols and guidelines were suggested by the researchers to improve their knowledge about the prevention and control of NCDs **(Akinwumi et al, 2021).**

Fig. 4.1: Knowledge on NCD

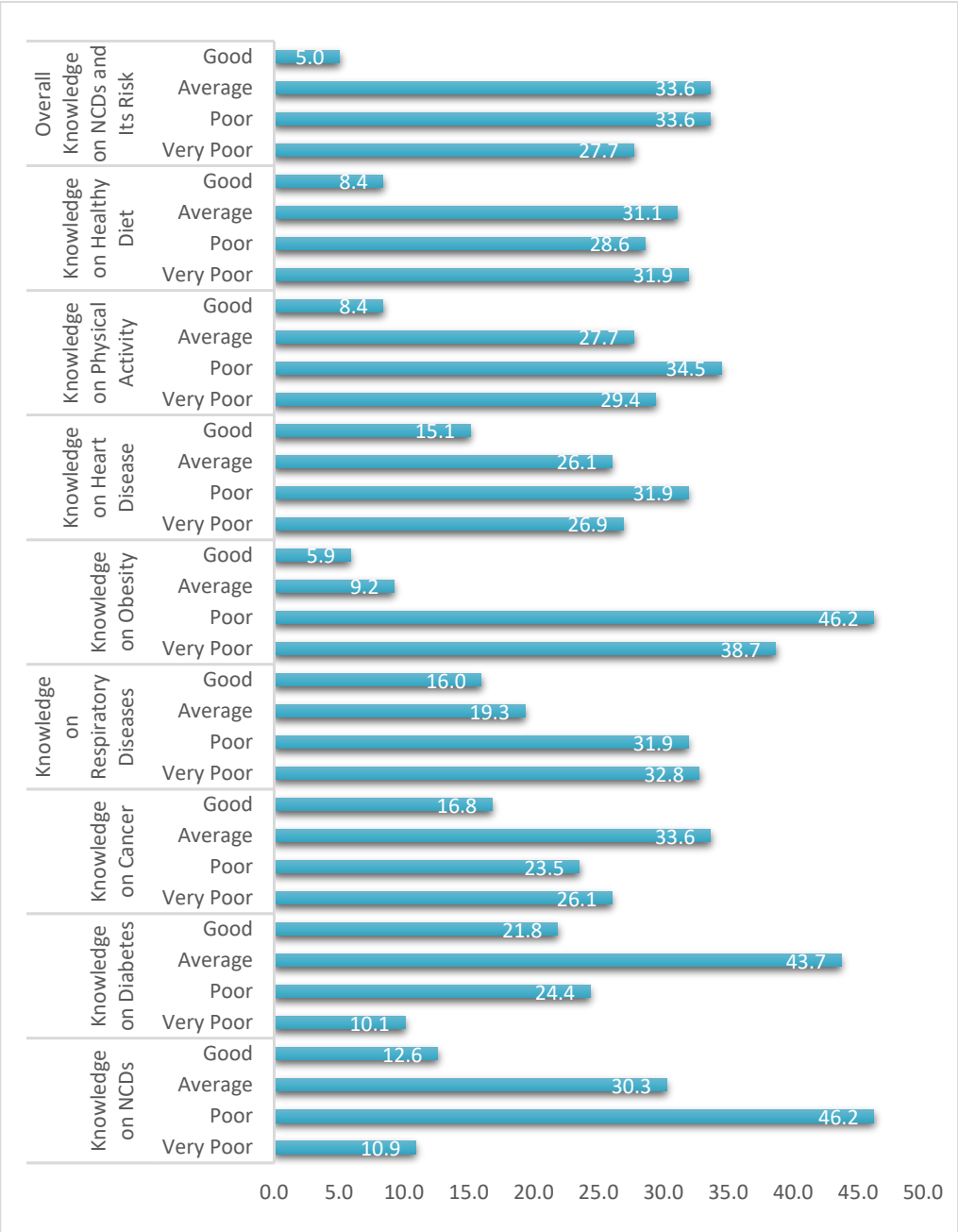


Table: 4.6 (a) University Employees Knowledge on NCDs

Background Characteristics		Knowledge on NCDs								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	11	13.8	46	**57.5**	21	26.3	2	2.5	.000*
	Female	2	5.1	9	23.1	15	38.5	13	**33.3**	
Age Groups	< 35 Years	2	18.2	6	**54.5**	2	18.2	1	9.1	.493
	35-44 Years	2	5.9	16	47.1	9	26.5	7	**20.6**	
	45-54 Years	6	12.5	23	47.9	13	27.1	6	**12.5**	
	55 & above	3	11.5	10	38.5	12	46.2	1	3.8	
Type of Employment	Teaching	0	0.0	15	41.7	11	30.6	10	**27.8**	.002*
	Non-Teaching	13	15.7	40	48.2	25	30.1	5	**6.0**	
Mode of Employment	Temporary	6	10.5	32	56.1	11	19.3	8	14.0	0.076
	Permanent	7	11.3	23	37.1	25	40.3	7	11.3	
Marital status	Married	10	9.7	51	49.5	29	28.2	13	12.6	.267
	Unmarried	3	18.8	4	25.0	7	43.8	2	12.5	
Education	Primary	1	**20.0**	2	40.0	2	40.0	0	0.0	.165
	Secondary	2	**40.0**	2	40.0	1	20.0	0	0.0	
	SSC	1	10.0	7	70.0	2	20.0	0	0.0	
	HSC	3	37.5	4	50.0	0	0.0	1	12.5	
	Graduation/post-graduation	4	7.1	25	44.6	20	35.7	7	12.5	
	More than post-graduation	2	5.7	15	42.9	11	31.4	7	**20.0**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6 (b) University Employees Knowledge on Diabetes

Background Characteristics		Knowledge on Diabetes								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	11	**13.8**	23	**28.8**	33	41.3	13	16.3	.029*
	Female	1	2.6	6	15.4	19	48.7	13	**33.3**	
Age Groups	< 35 Years	2	18.2	3	27.3	4	36.4	2	18.2	.962
	35-44 Years	3	8.8	8	23.5	16	47.1	7	20.6	
	45-54 Years	4	8.3	14	29.2	20	41.7	10	20.8	
	55 & above	3	11.5	4	15.4	12	46.2	7	**26.9**	
Type of Employment	Teaching	0	0.0	5	13.9	14	38.9	17	**47.2**	.000*
	Non-Teaching	12	**14.5**	24	28.9	38	45.8	9	**10.8**	
Mode of Employment	Temporary	6	10.5	20	35.1	19	33.3	12	21.1	.048*
	Permanent	6	9.7	9	14.5	33	53.2	14	22.6	
Marital status	Married	11	10.7	23	22.3	45	43.7	24	23.3	.509
	Unmarried	1	6.3	6	37.5	7	43.8	2	12.5	
Education	Primary	1	20.0	1	20.0	2	40.0	1	20.0	.168
	Secondary	2	**40.0**	1	20.0	1	20.0	1	20.0	
	SSC	1	10.0	3	30.0	4	40.0	2	20.0	
	HSC	2	25.0	3	37.5	3	37.5	0	0.0	
	Graduation/post-graduation	5	8.9	14	25.0	29	51.8	8	14.3	
	More than post-graduation(PhD)	1	2.9	7	20.0	13	37.1	14	**40.0**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6 (c) University Employees Knowledge on Cancer

Background Characteristics		Knowledge on Cancer								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	24	**30.0**	21	26.3	29	36.3	6	7.5	.002*
	Female	7	17.9	7	17.9	11	28.2	14	**35.9**	
Age Groups	< 35 Years	2	18.2	5	45.5	3	27.3	1	9.1	.595b
	35-44 Years	9	26.5	7	20.6	11	32.4	7	**20.6**	
	45-54 Years	16	33.3	8	16.7	17	35.4	7	14.6	
	55 & above	4	15.4	8	30.8	9	34.6	5	19.2	
Type of Employment	Teaching	2	5.6	8	22.2	11	30.6	15	**41.7**	.000*
	Non-Teaching	29	34.9	20	24.1	29	34.9	5	6.0	
Mode of Employment	Temporary	20	35.1	11	19.3	17	29.8	9	15.8	0.187
	Permanent	11	17.7	17	27.4	23	37.1	11	17.7	
Marital status	Married	28	27.2	24	23.3	34	33.0	17	16.5	.915
	Unmarried	3	18.8	4	25.0	6	37.5	3	18.8	
Education	Primary	0	0.0	2	40.0	3	60.0	0	0.0	.017*
	Secondary	3	60.0	1	20.0	1	20.0	0	0.0	
	SSC	4	40.0	2	20.0	4	40.0	0	0.0	
	HSC	4	50.0	1	12.5	3	37.5	0	0.0	
	Graduation/post-graduation	15	26.8	15	26.8	20	35.7	6	10.7	
	More than post-graduation	5	14.3	7	20.0	9	25.7	14	**40.0**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6 (d) University Employees Knowledge on Respiratory Diseases

Background Characteristics		Knowledge on Respiratory Diseases								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	31	**38.8**	28	35.0	14	17.5	7	**8.8**	.008*
	Female	8	**20.5**	10	25.6	9	23.1	12	**30.8**	
Age Groups	< 35 Years	4	36.4	4	36.4	3	27.3	0	0.0	.707
	35-44 Years	11	32.4	11	32.4	5	14.7	7	**20.6**	
	45-54 Years	19	39.6	13	27.1	9	18.8	7	14.6	
	55 & Above	5	19.2	10	38.5	6	23.1	5	**19.2**	
Type of Employment	Teaching	4	11.1	11	30.6	8	22.2	13	**36.1**	.000*
	Non-Teaching	35	42.2	27	32.5	15	18.1	6	7.2	
Mode of Employment	Temporary	23	40.4	18	31.6	8	14.0	8	14.0	0.288
	Permanent	16	25.8	20	32.3	15	24.2	11	17.7	
Marital status	Married	35	34.0	32	31.1	19	18.4	17	16.5	.809
	Unmarried	4	25.0	6	37.5	4	25.0	2	12.5	
Education	Primary	2	**40.0**	1	20.0	1	20.0	1	20.0	.083
	Secondary	3	**60.0**	2	40.0	0	0.0	0	0.0	
	SSC	5	50.0	3	30.0	1	10.0	1	**10.0**	
	HSC	4	50.0	4	50.0	0	0.0	0	0.0	
	Graduation/post-graduation	19	33.9	20	35.7	12	21.4	5	**8.9**	
	More than post-graduation (PhD)	6	17.1	8	22.9	9	25.7	12	**34.3**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6 (e) University Employees Knowledge on Obesity

Background Characteristics		Knowledge on Obesity								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	35	**43.8**	38	47.5	6	7.5	1	**1.3**	.010*
	Female	11	**28.2**	17	43.6	5	12.8	6	**15.4**	
Age Groups	< 35 Years	4	36.4	5	45.5	1	9.1	1	9.1	.059
	35-44 Years	13	38.2	15	44.1	1	2.9	5	**14.7**	
	45-54 Years	22	**45.8**	22	45.8	3	6.3	1	2.1	
	55 & above	7	26.9	13	50.0	6	23.1	0	0.0	
Type of Employment	Teaching	6	16.7	20	55.6	4	11.1	6	16.7	.000*
	Non-Teaching	40	48.2	35	42.2	7	8.4	1	1.2	
Mode of Employment	Temporary	25	43.9	22	38.6	6	10.5	4	7.0	.462
	Permanent	21	33.9	33	53.2	5	8.1	3	4.8	
Marital status	Married	41	39.8	48	46.6	8	7.8	6	5.8	.552
	Unmarried	5	31.3	7	43.8	3	18.8	1	6.3	
Education	Primary	1	20.0	3	60.0	1	20.0	0	0.0	.345
	Secondary	3	60.0	1	20.0	1	20.0	0	0.0	
	SSC	6	60.0	4	40.0	0	0.0	0	0.0	
	HSC	5	62.5	3	37.5	0	0.0	0	0.0	
	Graduation/post-graduation	23	41.1	26	46.4	5	8.9	2	3.6	
	More than post-graduation (PhD)	8	22.9	18	51.4	4	11.4	5	14.3	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6(f) University Employees Knowledge on Heart Diseases

Background Characteristics		Knowledge on Heart Disease								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	26	32.5	27	**33.8**	23	28.8	4	**5.0**	.000*
	Female	6	15.4	11	**28.2**	8	20.5	14	**35.9**	
Age Groups	< 35 Years	3	27.3	4	**36.4**	3	27.3	1	9.1	.996
	35-44 Years	8	23.5	12	**35.3**	8	23.5	6	17.6	
	45-54 Years	14	29.2	15	31.3	13	27.1	6	12.5	
	55 & above	7	26.9	7	26.9	7	26.9	5	**19.2**	
Type of Employment	Teaching	4	11.1	5	13.9	13	36.1	14	**38.9**	.000*
	Non-Teaching	28	33.7	33	39.8	18	21.7	4	**4.8**	
Mode of Employment	Temporary	16	28.1	22	38.6	10	17.5	9	15.8	0.199
	Permanent	16	25.8	16	25.8	21	33.9	9	14.5	
Marital status	Married	29	28.2	30	29.1	29	28.2	15	14.6	.283
	Unmarried	3	18.8	8	50.0	2	12.5	3	18.8	
Education	Primary	2	40.0	2	40.0	1	20.0	0	0.0	.022*
	Secondary	2	40.0	3	60.0	0	0.0	0	0.0	
	SSC	4	40.0	3	30.0	3	30.0	0	0.0	
	HSC	5	62.5	3	37.5	0	0.0	0	0.0	
	Graduation/post-graduation	14	25.0	20	35.7	16	28.6	6	10.7	
	More than post-graduation (PhD)	5	14.3	7	20.0	11	31.4	12	34.3	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6(g) University Employees Knowledge on Physical Activity

Background Characteristics		Knowledge on Physical Activity								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	29	**36.3**	29	36.3	18	22.5	4	5.0	.020*
	Female	6	**15.4**	12	30.8	15	38.5	6	15.4	
Age Groups	< 35 Years	3	27.3	3	27.3	5	45.5	0	0.0	.054
	35-44 Years	10	29.4	9	26.5	8	23.5	7	20.6	
	45-54 Years	18	37.5	15	31.3	13	27.1	2	4.2	
	55 & above	4	15.4	14	**53.8**	7	26.9	1	3.8	
Type of Employment	Teaching	3	8.3	10	27.8	15	41.7	8	**22.2**	.000*
	Non-Teaching	32	38.6	31	37.3	18	21.7	2	**2.4**	
Mode of Employment	Temporary	22	38.6	15	26.3	13	22.8	7	12.3	.043*
	Permanent	13	21.0	26	41.9	20	32.3	3	4.8	
Marital status	Married	32	31.1	35	34.0	27	26.2	9	8.7	.682
	Unmarried	3	18.8	6	37.5	6	37.5	1	6.3	
Education	Primary	0	0.0	3	**60.0**	2	40.0	0	0.0	.005*
	Secondary	3	60.0	2	**40.0**	0	0.0	0	0.0	
	SSC	6	60.0	2	20.0	1	10.0	1	10.0	
	HSC	4	50.0	4	50.0	0	0.0	0	0.0	
	Graduation/post-graduation	18	32.1	19	33.9	18	32.1	1	1.8	
	More than post-graduation	4	11.4	11	31.4	12	34.3	8	**22.9**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table 4.6 (h) University Employees Knowledge on Healthy Diet

Background Characteristics		Knowledge on Healthy Diet								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	31	**38.8**	24	30.0	23	28.8	2	**2.5**	.003*
	Female	7	**17.9**	10	25.6	14	35.9	8	**20.5**	
Age Groups	< 35 Years	2	18.2	6	**54.5**	2	18.2	1	9.1	.462
	35-44 Years	11	32.4	6	17.6	13	38.2	4	11.8	
	45-54 Years	16	33.3	12	25.0	16	33.3	4	8.3	
	55 & above	9	34.6	10	38.5	6	23.1	1	3.8	
Type of Employment	Teaching	4	11.1	7	19.4	16	44.4	9	**25.0**	.000*
	Non-Teaching	34	41.0	27	32.5	21	25.3	1	**1.2**	
Mode of Employment	Temporary	21	36.8	17	29.8	13	22.8	6	10.5	0.274
	Permanent	17	27.4	17	27.4	24	38.7	4	6.5	
Marital status	Married	36	35.0	28	27.2	30	29.1	9	8.7	.289
	Unmarried	2	12.5	6	37.5	7	43.8	1	6.3	
Education	Primary	1	20.0	2	40.0	2	40.0	0	0.0	.006*
	Secondary	4	**80.0**	1	20.0	0	0.0	0	0.0	
	SSC	7	70.0	0	0.0	3	30.0	0	0.0	
	HSC	5	62.5	3	37.5	0	0.0	0	0.0	
	Graduation/post-graduation	16	28.6	19	33.9	18	32.1	3	5.4	
	More than post-graduation	5	14.3	9	25.7	14	40.0	7	**20.0**	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

Table: 4.6 (i) Knowledge and Attitudes on overall NCDs and Its Risk factors among University Employees

Background Characteristics		Overall, Knowledge on NCDs and Its Risk								Chi-square p value
		Very Poor		Poor		Average		Good		
		N	%	N	%	N	%	N	%	
Sex	Male	27	33.8	30	37.5	22	27.5	1	1.3	.003*
	Female	6	15.4	10	25.6	18	46.2	5	12.8	
Age Groups	< 35 Years	2	18.2	5	45.5	4	36.4	0	0.0	.617
	35-44 Years	9	26.5	9	26.5	12	35.3	4	11.8	
	45-54 Years	15	31.3	15	31.3	17	35.4	1	2.1	
	55 & above	7	26.9	11	42.3	7	26.9	1	3.8	
Type of Employment	Teaching	2	5.6	8	22.2	21	58.3	5	13.9	.000*
	Non-Teaching	31	37.3	32	38.6	19	22.9	1	1.2	
Mode of Employment	Temporary	18	31.6	21	36.8	14	24.6	4	7.0	.218
	Permanent	15	24.2	19	30.6	26	41.9	2	3.2	
Marital status	Married	30	29.1	35	34.0	33	32.0	5	4.9	.756
	Unmarried	3	18.8	5	31.3	7	43.8	1	6.3	
Education	Primary	1	20.0	2	40.0	2	40.0	0	0.0	.006*
	Secondary	3	60.0	2	40.0	0	0.0	0	0.0	
	SSC	6	60.0	2	20.0	2	20.0	0	0.0	
	HSC	5	62.5	3	37.5	0	0.0	0	0.0	
	Graduation/post-graduation	14	25.0	23	41.1	18	32.1	1	1.8	
	More than post-graduation (PhD)	4	11.4	8	22.9	18	51.4	5	14.3	
Number of family members	<5	18	23.7	24	31.6	32	42.1	2	2.6	.038*
	5 & above	15	34.9	16	37.2	8	18.6	4	9.3	
Family History of any Chronic Diseases	No	16	32.7	20	40.8	12	24.5	1	2.0	.135
	Yes	17	24.3	20	28.6	28	40.0	5	7.1	

Note: Chi-square test: * p<.05 Significance; p>0.05 Not significance

In comparison **to men, women had 33% good knowledge on NCDs (Table 4.6.a) and it was significantly proven (p< 0.05). Participants under the age of 35 years were found to have less (54%) knowledge on NCDs, while those between the ages of 35 and 54 years (33%) had a good understanding on NCDs.**

It was statistically significant (p<0.001) that teaching staff of the university (28%) had higher knowledge than non-teaching staff (6%). It was also seen that 20% of the subjects who had PhD qualifications had good knowledge, while participants with primary and secondary education (60%) had very poor knowledge.

Education is important for control and prevention of non- communicable diseases and for a healthy lifestyle (Table 4.6 a).

As compared to men, 33% of women had good knowledge on diabetes (Table: 4.6 b) while men had (42%) almost no knowledge of diabetes, and this was statistically significant (p<0.029).

Those above the age of 55 years had better knowledge on diabetes.

The mean knowledge scores of prevention and control of the NCDs amongst the health care workers were lowest for diabetes mellitus, 5.5 ± 1.8 in the rural and 5.4 ± 1.7 in the urban local government areas in Osun State, Nigeria **(Akinwumi et al, 2021).**

Teaching employees (47%) had significantly higher knowledge than non-teaching employees (11%), while 14% non-teaching staff had very poor knowledge on diabetes (p<0.001).

However, it was observed that participants with PhDs (40%) possessed good knowledge on diabetes. 40% of those with secondary education possessed very poor knowledge, **emphasizing again that education is important for control & prevention of non-communicable diseases.**

It was statistically significant (p< 0.002) that in comparison **to men, women had (36%) good knowledge on cancer, while men had (30%) very poor knowledge on cancer.**

Participants between the age group of 35 to 44 years had (20%) good knowledge than the other age groups.

It was statistically significant (p<0.001) that teaching staff (42%) had higher knowledge than non-teaching staff (6%) of the university (Table: 4.6 b).

Those participants having higher education (Ph.D.) had good knowledge regarding cancer and it was statistically significant (p< 0.017), **reiterating the importance of education in the control and prevention of NCDs.**

Women had (31%) good knowledge on respiratory diseases than men (9%) and it was statistically significant (p<0.008). 39% men and 20% women had very poor knowledge on respiratory diseases.

Teaching employees (36%) had significantly (p< 0.000) more knowledge on respiratory diseases than non-teaching employees (7%).

Participants with PhDs (34%), graduates or postgraduates (9%), and SSCs (10%) demonstrated superior knowledge, whereas participants having primary (40%) and secondary education (60%) demonstrated poor knowledge**, highlighting once more the significance of education in the management and prevention of NCDs.**

In **table 4.6 (e) it was seen that females (15%) had better knowledge on obesity than males (1%) and it was statistically significant (p< 0.010) and 72% of the total population under study had very poor knowledge on obesity.**

Participants aged 45–54 (46%) years had very poor knowledge on obesity, whereas 15% in the age group of 35–44 years had good knowledge.

It was statistically significant (p < 0.001) that teaching staff (17%) had higher knowledge than non-teaching staff (1%).

It is worth repeating that education is critical for enhancing knowledge for preventing and controlling non-communicable diseases.

Table 4.6 (f) revealed that more females (36%) had good knowledge of heart diseases than males (5%) and it was statistically significant (p< 0.001). 62% of the total population had very poor knowledge on heart diseases. Participants aged less than 35 years (36%) and aged between 35–44 years (35%) had poor knowledge on heart diseases, whereas those aged 55 & above (19%) had a higher understanding than others. It was observed that teaching employees (39%) had higher knowledge than non-teaching employees (5%), which was statistically significant (p < 0.001). It was also statistically significant (p<0.022) that 34% of the employees with PhD degrees had good knowledge on heart diseases.

Education is essential for upgrading the knowledge in controlling & preventing NCDs and these needs to be emphasized again.

Men (5%) had inadequate knowledge on physical activity than women (15%) and it was statistically significant (p<0.020). Those participants 55 years & above (54%) had poor knowledge on physical activity (**Table 4.6 g)**.

Teaching employees (22%) had statistically significant (p<0.000) higher knowledge than non-teaching employees (2%) of the university. It was statistically significant (p<0.005), that participants with only primary education (60%) exhibited low knowledge levels, compared to subjects with higher education who had good knowledge.

As can be seen from Table 4.6 g, it probably goes without saying that education is critical for the knowledge in controlling and preventing NCDs.

It was evident that men (39%) had very poor knowledge than women (18%) about healthy diets and it was statistically significant (p<0.003). Poor knowledge on healthy diets was seen among the age group of less than 35 years (54%), whereas those between the age group of 45-54 years had good knowledge.

25% of the total teaching employees had significantly (p< 0.000) higher knowledge than non-teaching employees (1%). Participants with only secondary education (80%) demonstrated low knowledge levels, compared to PhDs who had good knowledge as shown in **Table 4.6 h.**

It needs to be clear again how important education is for boosting the knowledge in controlling and preventing NCDs.

As seen from Table 4.6 (i), summing up the overall knowledge on NCDs and its risk factors, it was statistically significant that females (13%) had higher knowledge than males (1%) (p<0.003), teaching employees had higher knowledge than non-teaching employees (p<0.000) and education was statistically significant for increasing the knowledge in preventing and controlling NCDs.

A study by **Jayanna K et al (2019)** to identify gaps and design interventions for hypertension and diabetes across the care continuum using an established continuum of care framework found lack of education, high tobacco usage, high alcohol consumption, insufficient physical activity and improper diet among the urban-population of Mysore city .

Table: 4.7 (a) Substance Abuse among university employees

		N	%
Addiction Behaviour			
1. Do you consume Alcohol such as beer, wine or any other?	Yes	26	**22**
	No	93	78
	Total	119	100
2. What is the frequency of alcohol consumption?	Never	93	78
	Daily	1	1
	Weekly	4	3
	Occasionally	21	**18**
	Total	119	100
3. Do you chew tobacco/smoke?	Yes	17	**14**
	No	102	86
	Total	119	100

Only 22 % were consuming alcohol of which 18 % were consuming occasionally and 14% were smoking or chewing tobacco **(Table: 4.7 a). The frequency of the subtance abuse was less in the population.**

Alcohol consumption, tobacco use, lack of physical activity, high BMI and lack of fruits and vegetables account for almost one-third of cancer fatalities (WHO 2022).

Table: 4.7 (b) Distribution of Dietary Pattern & Food Consumption of Employees

Dietary Pattern & Food Consumption		N	%
4. What is your fruit consumption in a day?	<150 gram	97	82
	≥150 gram	22	**18**
	Total	119	100
5. What is your vegetables (excluding potato) consumption in a day?	<250 gram	63	**53**
	≥250 gram	56	47
	Total	119	100
6. What is the frequency of fruit consumption?	Never	0	0
	Daily	43	36
	Weekly	50	42

	Occasionally	26	22
	Total	119	100
7. What is the frequency of eating meal outside	Never	10	8
	Daily	6	**5**
	Weekly	22	**18**
	Occasionally	81	**68**
	Total	119	100
8. What is the frequency of consumption of bajra, sorghum,jawar,maize (coarse grains)?	Never	10	8
	Daily	25	21
	Weekly	32	**27**
	Occasionally	52	**44**
	Total	119	100
9. Do you take breakfast?	Yes	95	80
	No	24	**20**
	Total	119	100
10. Do you take lunch?	Yes	103	87
	No	16	**13**
	Total	119	100
11. Snack at office?	Yes	48	**40**
	No	71	60
	Total	119	100
12. How often do you add salt to your food right before you eat it or while you are eating it?	Never	59	50
	Sometimes	11	9
	Always	49	**41**
	Total	119	100
13. How often do you eat ultra- processed food ?	Never	27	23
	Daily	24	20
	Twice a week	68	**57**
	Total	119	100
14. How often do you eat preserved/ canned salty products?	Never	32	27
	Daily	17	**14**
	Twice a week	70	**59**
	Total	119	100
15. How often do you take homemade high salt containing food like chutney, pickle, chunda, etc.?	Never	39	33
	Daily	16	13
	Twice a week	64	**54**
	Total	119	100
16. How often do you take other dairy products having high salt like, processed/packaged cheese, butter, etc.	Never	55	46
	Daily	10	8
	Twice a week	54	**45**
	Total	119	100
17. How often do you eat	Never	35	29

fried foods like bhajiya, samosa, gota and bread pakoda?	Daily	6	5
	Twice a week	78	**66**
	Total	119	100
18. What is the frequency of consumption of refined flour (maida)	Never	11	9
	Daily	8	7
	Weekly	15	13
	Occasionally	85	71
	Total	119	100

82% of the participants were consuming less than 150 grams of fruits and 53% were consuming less than 250 grams of vegetables in a day as against 400 grams (i.e. five portion) of fruits and vegetables recommended by WHO in a day (Table 4.7 b).

The frequency of eating meals outside was 68% occasionally, 18% weekly, and 5% daily in this study. Consumption of millets (such as bajra, sorghum, jowar, maize) was not very frequent- 27% once weekly and 44% occasionally. **20% never took breakfast and 13% never took lunch.40%of the population were in the habit of consuming snacks in the office.** It is to be noted that none of the university canteens served healthy snacks. **41% of the participants always added salt at the dinner table.** Ultra-processed food, preserved /canned products, highly salted food items, dairy products and fried food item high in trans-fat were consumed twice a week by 57%, 59%, 54%, 45% &66% respectively. The consumption of refined flour (maida) was not frequent in the study **(Table4.7 b).**

Table: 4.7 (c) Physical Activity & Sedentary lifestyle

Physical Activity & Sedentary lifestyle		N	%
19.Do you walk for 10minutes or use a bicycle for at least 10 minutes continuously to get to and from places?	Yes	89	**75**
	No	30	25
	Total	**119**	**100**
20. If yes, a week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Never	30	25
	Daily	70	**59**
	Once a week	6	5
	Twice a week	4	3
	Thrice and more than thrice a week	9	8
	Total	119	100
21. In a week, if you walk or bicycle,	No	30	25

how much time do you spend walking or bicycling (write hours/minutes)? (min)	<180 Minutes	21	18
	≥180 Minutes	68	**57**
	Total	119	100
22. Do you do any vigorous-intensity sports, fitness or a recreational (leisure) activity that causes large increase in breathing or heart rate like [running /badminton/football] for at least 10 minutes continuously?	Yes	19	**16**
	No	100	84
	Total	119	100
23. If yes, in a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Never	100	84
	Daily	7	6
	Once a week	7	6
	Twice a week	4	3
	Thrice and more than thrice a week	1	1
	Total	119	100
24. On a typical day that you do vigorous – intensity sports, fitness or recreational (leisure) activates how much time do you spend on these activities (write hours/minutes)?	No	100	84
	<180 Minutes	5	4
	≥180 Minutes	14	12
	Total	119	100
25. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, and volleyball] for at least 10 minutes continuously?	Yes	40	**34**
	No	79	66
	Total	119	100
26. If yes, in a typical week, how many days do you do moderate-intensity sports, fitness or recreational activities?	Never	79	66
	Daily	19	**16**
	Once a week	14	12
	Twice a week	3	3
	Thrice and more than thrice a week	4	3
	Total	119	100
27. On a typical day that you do moderate intensity sports, fitness or recreational activities how much time do you spend on these activities (write hours/minutes)?	No	79	66
	<180 Minutes	20	17
	≥180 Minutes	20	17
	Total	119	100
28.How many hours do you sleep at night?	8 Hrs. & above	33	28
	6-7 Hrs.	66	**55**
	<6 Hrs.	20	17
	Total	119	100
29. Do you sleep daily in the afternoon?	Yes	15	13
	No	104	87
	Total	119	100
30.If yes, than how many hours do	Not sleep	104	87

you sleep?	<1 Hrs.	10	8
	1-2 Hrs.	4	3
	>2 Hrs	1	1
	Total	119	100
31. Do you do any kind of exercise (yoga, walking or any other) early morning?	Yes	56	**47**
	No	63	53
	Total	119	100
32. Do you do any kind of exercise (yoga, walking or any other) in evening?	Yes	58	**49**
	No	61	51
	Total	**119**	**100**
33. After dinner (at night) what do you do?	Go for walk	51	**43**
	Sit & watch TV	64	**54**
	Go directly to sleep	4	3
	Total	119	100
34. How long do you sit continuously in the chair in office?	<2 Hrs.	53	**45**
	2-4 Hrs.	30	25
	5 Hrs. & above	36	**30**
	Total	119	100
35. How much time do you spend watching television?	Never	19	16
	1-4 Hrs.	66	**55**
	>4 Hrs.	5	4
	Occasionally	29	24
	Total	119	100
36. How much time do you spend working on computer?	Never	36	30
	<4 Hrs.	43	36
	4 Hrs & above	40	**34**
	Total	119	100
37. How much time do you spend playing games in mobile / tablet?	Never	83	70
	<3 Hrs.	31	26
	3 Hrs. & above	5	4
	Total	119	100
38. How much time do you spend talking with friends or doing other sitting activities like writing and reading newspaper etc.?	Never	36	30
	<2 Hrs.	78	**66**
	2 Hrs. & above	5	4
	Total	119	100

From **Table 4.7 c**, it is seen that 75% of the study population walk or bicycle for ten minutes and 59% do it daily and 57% spent more than 180 minutes per week walking/bicycling per week **(WHO recommends 60 minutes/day walking for five days in a week).** Physical activity in terms of vigorous- intensity exercises /sports was done by only 16 % and only 34% were involved in moderate intensity exercise/ sports**(WHO recommends 75-150 minutes of vigorous- intensity & 150-300 minutes of moderate intensity exercise/ sports per week).**

Majority (55%) of the study population slept for 6-7 hours in the night. 47% & 48% of the employees did exercises or yoga daily in the morning or evening respectively. 45% used to sit continuously in the chair in office for less than 2 hours whereas 30% employees were sitting 5 hours or more. 55% of the participants were watching television for 1-4 hrs. daily. After dinner most of them (54%) watched T.V and 43% went for night walk. 34% spent more than 4 hours on computer/ laptop but not for gaming and 66% spent less than 2 hours a day on sedentary activities like talking to friends, reading newspaper, etc.

Section-2

This section dealt with 6th objective of study.

Table: 4.8 Comparison of anthropometric characteristics of the participants before and after intervention

		Pre Intervention		Post Intervention	
		N	%	N	%
Nutritional Status	Underweight	2	1.7	2	1.7
	Normal	26	21.8	22	18.5
	Overweight	15	12.6	22	18.5
	Obese	76	**63.9**	73	**61.3**
	Total	119	100.0	119	100.0
WHR for Male	Unhealthy	12	**15.0**	11	**13.8**
	Healthy	68	85.0	69	86.3
	Total	80	100.0	80	100.0
WHR for Female	Unhealthy	32	**82.1**	32	**82.1**
	Healthy	7	17.9	7	17.9
	Total	39	100.0	39	100.0
WC for Male	Unhealthy	62	**77.5**	63	**78.8**
	Healthy	18	22.5	17	21.3
	Total	80	100.0	80	100.0
WC for Female	Unhealthy	36	**92.3**	35	**89.7**
	Healthy	3	7.7	4	10.3
	Total	39	100.0	39	100.0
Blood Pressure	Optimal	14	**11.8**	20	**16.8**
	Near Optimal	53	**44.5**	64	**53.8**
	Borderline High	36	**30.3**	24	**20.2**
	High	16	**13.4**	11	**9.2**
	Total	119	100.0	119	100.0
Triglycerides	Normal	83	74.1	67	60.4
	Borderline High	15	13.4	24	21.6
	High	14	12.5	20	18.0
	Total	112	100.0	111	100.0
HDL Cholesterol	High risk	6	5.5	12	10.8
	Desirable	88	80.0	87	78.4
	Low risk	16	14.5	12	10.8
	Total	110	100.0	111	100.0
LDL Cholesterol	Optimal	58	53.2	56	50.9
	Near	26	23.9	32	29.1

	Optimal				
	Borderline High	21	19.3	17	15.5
	High	4	3.7	5	4.5
	Total	109	100.0	110	100.0
Cholesterol	Desirable	85	76.6	78	70.3
	Borderline High	21	18.9	24	21.6
	High	5	4.5	9	8.1
	Total	111	100.0	111	100.0
Fasting Plasma Glucose	Normal	27	**23.1**	44	**37.0**
	Pre diabetes	63	53.8	51	42.9
	Diabetes	27	**23.1**	24	**20.2**
	Total	117	100.0	119	100.0
HbA1c	Normal	60	**53.6**	66	**56.9**
	Pre diabetes	20	17.9	24	20.7
	Diabetes	32	**28.6**	26	**22.4**
	Total	112	100.0	116	100.0

From table 4.8 it was seen that there was a decrease in obesity from 64% to 61% in post result (fig.4.2) and there was a decrease in female abdominal obesity (high WC) from 92% to 89% whereas no significant changes were seen in WHR in both males and females **(fig.4.3)**.16% employees had normal blood pressure, while there was a decrease in those having high blood pressure**(stage 2 hypertension: ≥160 mmHg/≥100mmHg) from 13% to 9% and there was a decrease seen in stage 1 hypertension(140-159mmHg/90-99mmHg) from 30% to 20% (fig.4.3).** Yoga was found to be a successful, secure, and affordable adjunct therapy for the treatment of hypertension (**Hadaye et al, 2021)**.

The lipid profile did not show any significant changes

There was a decrease in the number of participants who were diabetic with respect to HbA1c values, from **28.6% to 22%. Elevated blood glucose is responsible for around 20% of cardiovascular fatalities (WHO 2022).**

Fig.4.2: Impact of intervention on Nutrition Status & Blood Pressure

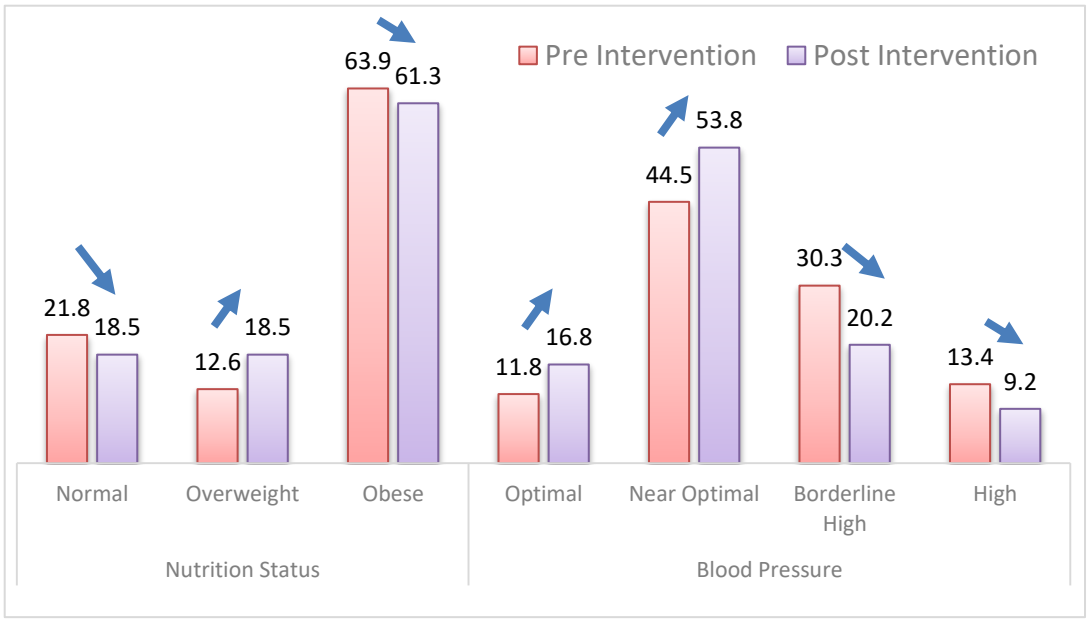
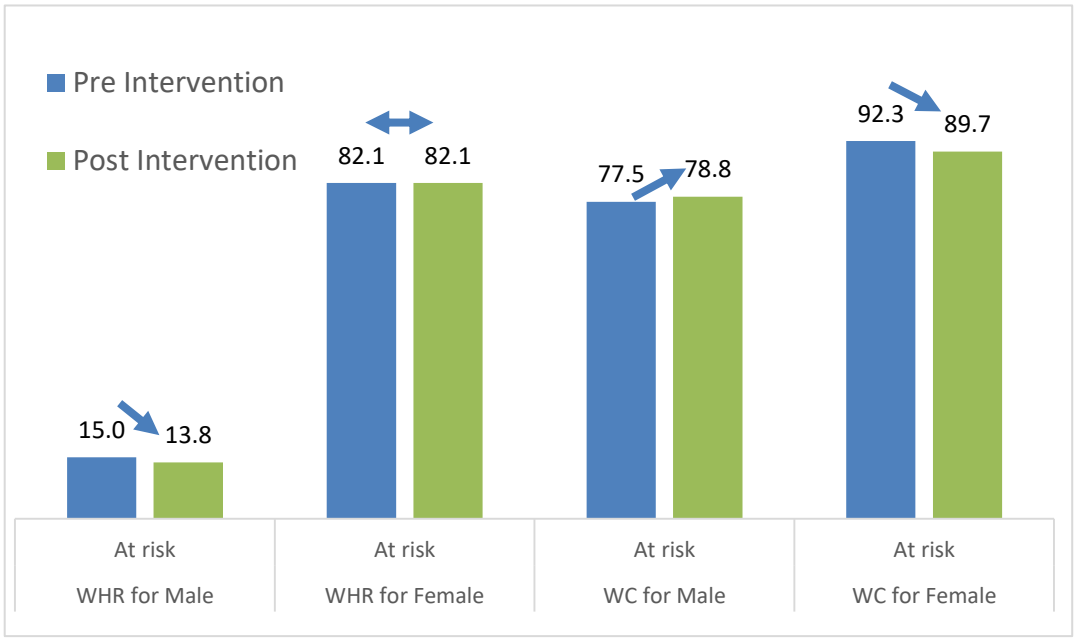


Fig.4.3: Impact of intervention on Waist-Hip Ration & Waist Circumference



Section-3

This section deals with 7th and 8th objective of the study.

Table: 4.9 Impact of intervention on knowledge of the participants

		Pre Intervention	Post Intervention
		%	%
Knowledge on NCDs	Very Poor	10.9	0.0
	Poor	46.2	17.6
	Average	30.3	44.5
	Good	12.6	37.8
	Total	100.0	100.0
Knowledge on Diabetes	Very Poor	10.1	0.0
	Poor	24.4	6.7
	Average	43.7	51.3
	Good	21.8	42.0
	Total	100.0	100.0
Knowledge on Cancer	Very Poor	26.1	0.0
	Poor	23.5	11.8
	Average	33.6	51.3
	Good	16.8	37.0
	Total	100.0	100.0
Knowledge on Respiratory Diseases	Very Poor	32.8	0.0
	Poor	31.9	9.2
	Average	19.3	51.3
	Good	16.0	39.5
	Total	100.0	100.0
Knowledge on Obesity	Very Poor	38.7	7.6
	Poor	46.2	27.7
	Average	9.2	37.8
	Good	5.9	26.9
	Total	100.0	100.0
Knowledge on Heart Disease	Very Poor	26.9	2.5
	Poor	31.9	29.4
	Average	26.1	41.2
	Good	15.1	26.9
	Total	100.0	100.0

Knowledge on Physical Activity	Very Poor	29.4	3.4
	Poor	34.5	14.3
	Average	27.7	48.7
	Good	8.4	33.6
	Total	100.0	100.0
Knowledge on Healthy Diet	Very Poor	31.9	0.0
	Poor	28.6	13.4
	Average	31.1	53.8
	Good	8.4	32.8
	Total	100.0	100.0
Overall Knowledge on NCDs and Its Risk	Very Poor	27.7	0.0
	Poor	33.6	7.6
	Average	33.6	58.0
	Good	5.0	34.5
	Total	100.0	100.0

From table 4.9 it was seen in post intervention, that the knowledge among employees on fundamentals of NCDs and its risk factors increased significantly from very poor **(11% to 0%)** and poor**(46% to 17%)** to average**(30% to 44%)** and good **(12% to 37%)** and their knowledge on diabetes increased significantly from very poor **(10% to 0%)** and poor **(24% to 6%)** to average **(43% to 51%)** and good **(21% to 42%), (fig.4.4).** Knowledge regarding cancer and respiratory disease**(fig.4.5)** increased significantly from very poor **(26% to 0%; 32% to 0%)** and poor **(23% to 11%; 32% to 9%)** to average **(33% to 51%; 19% to 51%)** and good **(16% to 37%; 16% to 39%)** respectively similarly knowledge on obesity also increased from very poor and poor to average and good and knowledge regarding heart diseases also increased significantly from very poor and poor to average and good (**fig.4.6)**. In **figure 4.7,** it is seen that the knowledge regarding physical activity and healthy diets among employees also increased significantly in a similar way.

Summing up the overall knowledge on NCDs and its risk factors among university employees increased significantly from very poor **(27% to 0%)** and poor **(33% to 7%)** to average **(33% to 58%)** and good **(5% to 34%).** A study by **Chaudhari et al (2015)** significant improvement in the knowledge of NCDs in school going students after a single educational session which lasted for only 45 minutes.

Fig.4.4: Impact of intervention on Knowledge regarding NCDs & Diabetes

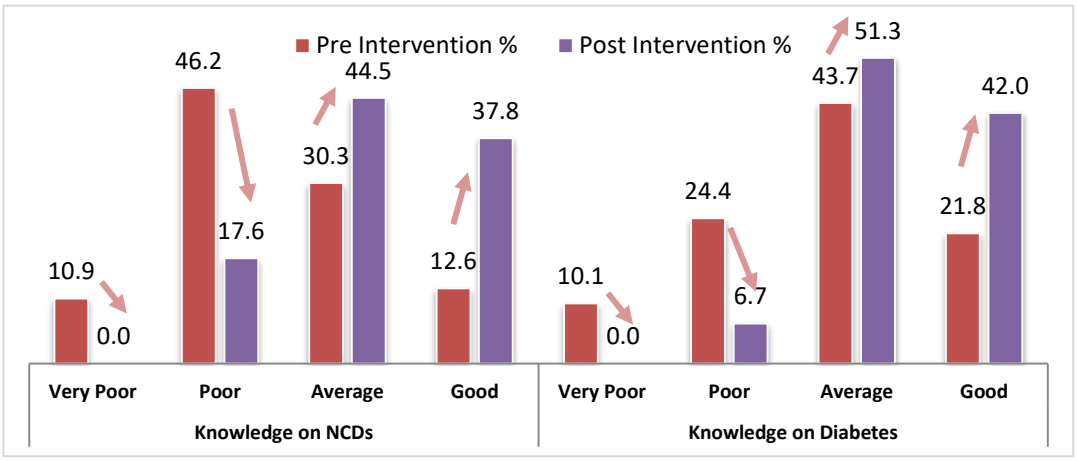


Fig.4.5: Impact of intervention on Knowledge regarding cancer & Respiratory Diseases

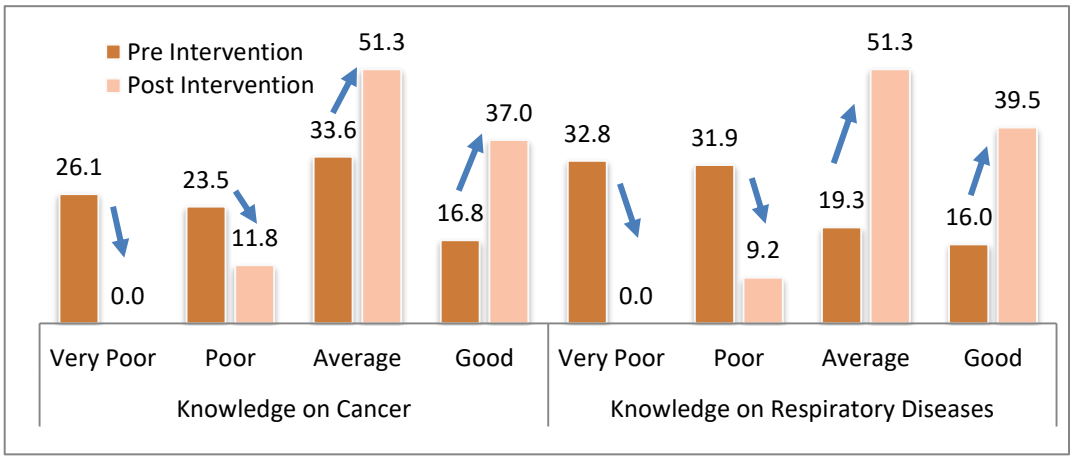


Fig.4.6: Impact of intervention on Knowledge regarding Obesity & Heart Diseases

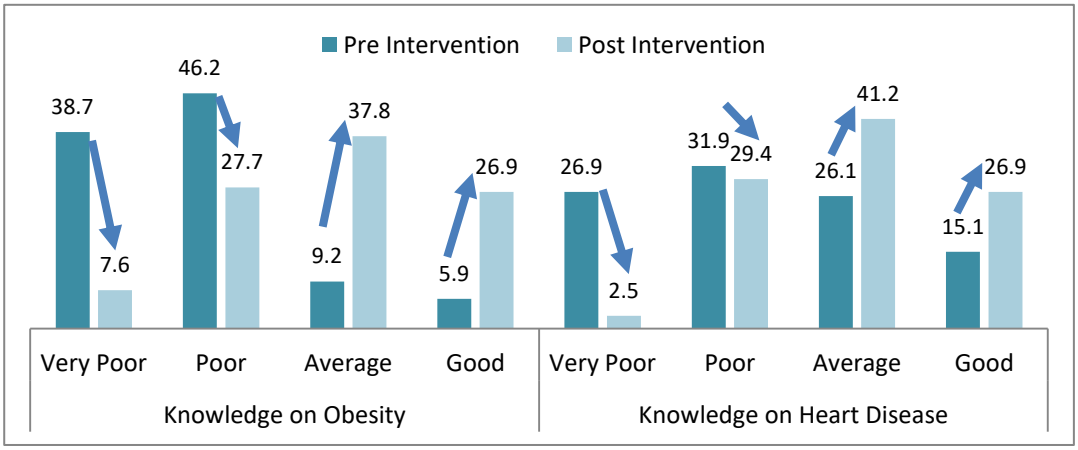


Fig.4.7: Impact of intervention on Knowledge regarding Physical activity, Healthy Diets & Overall Scores

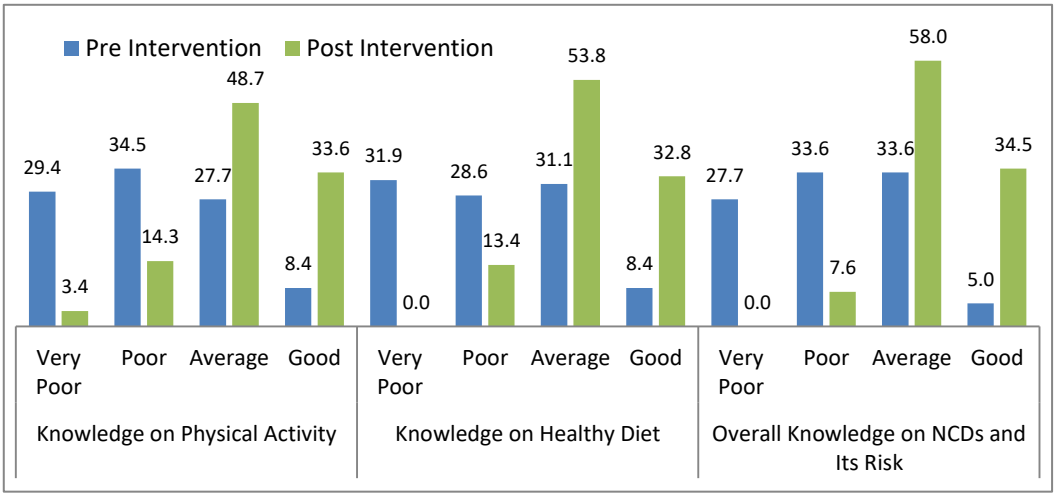


Table: 4.10 (a) Comparison of Addiction Behaviour of the participants before and after intervention

Addiction Behaviour		Pre-Intervention		Post-Intervention	
		N	%	N	%
Do you consume Alcohol such as beer, wine or any other?	Yes	26	22	23	**19.3**
	No	93	78	96	**80.7**
	Total	119	100	119	100.0
What is the frequency of alcohol consumption?	Never	93	78	97	**81.5**
	Daily	1	1	1	0.8
	Weekly	4	3	3	2.5
	Occasionally	21	18	18	15.1
	Total	119	100	119	100.0
Do you chew tobacco/smoke?	Yes	17	14	16	**13.4**
	No	102	86	103	**86.6**
	Total	119	100	119	100.0

Table 4.10.a & Fig. 4.8; show a decrease in alcohol consumption (22 to 19%) and tobacco usage (14% to 13%) post intervention. **Bhatt G et al (2021)** concluded that a culturally specific patient-centric intervention package focusing on behavior change was sustainable way to help NCD patients quit tobacco successfully.

Fig. 4.8: Impact of intervention on substance abuse behaviour

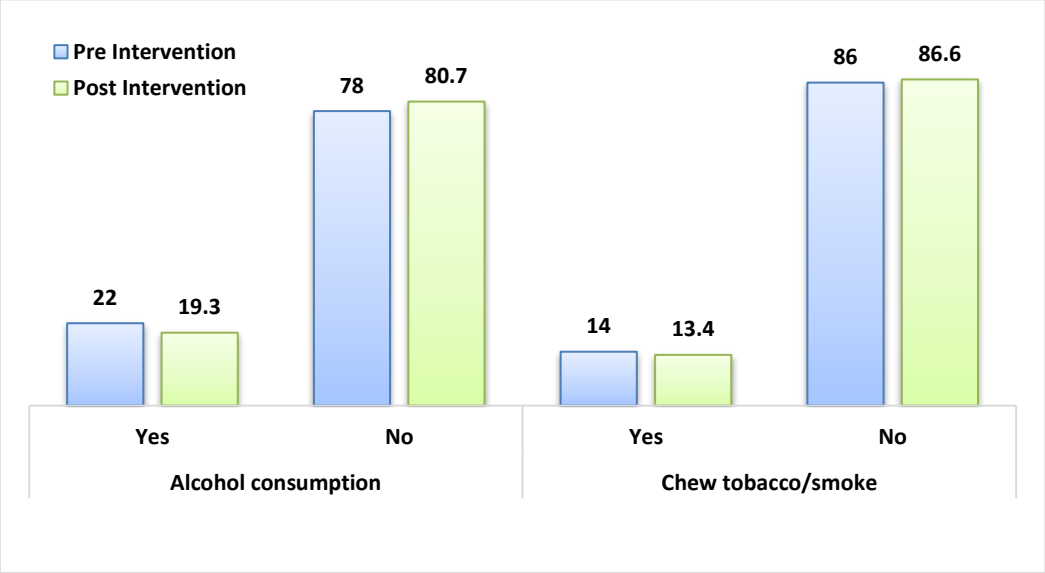


Table: 4.10(b) Comparison of Practices on Dietary Pattern & Food Consumption of the participants before and after intervention

Dietary Pattern & Food Consumption		Pre-Intervention		Post-Intervention	
		N	%	N	%
4. What is your fruit consumption in a day?	<150 gram	97	82	81	68.1
	≥150 gram	22	**18**	38	**31.9**
	Total	119	100	119	100.0
5. What is your vegetables (excluding potato) consumption in a day?	<250 gram	63	53	54	45.4
	≥250 gram	56	**47**	65	**54.6**
	Total	119	100	119	100.0
6. What is the frequency of fruit consumption?	Never	0	0	11	9.2
	Daily	43	**36**	46	**38.7**
	Weekly	50	42	45	37.8
	Occasionally	26	22	17	14.3
	Total	119	100	119	100.0
7. What is the frequency of eating meal outside	Never	10	8	17	14.3
	Daily	6	**5**	3	**2.5**
	Weekly	22	18	23	19.3
	Occasionally	81	68	76	63.9
	Total	119	100	119	100.0
8. What is the frequency of	Never	10	8	13	10.9
	Daily	25	21	19	16.0

consumption of bajra, sorghum, jowar, maize (coarse grains)?	Weekly	32	27	44	37.0
	Occasionally	52	44	43	36.1
	Total	119	100	119	100.0
9. Do you take breakfast?	Yes	95	**80**	106	**89.1**
	No	24	20	13	10.9
	Total	119	100	119	100.0
10. Do you take lunch?	Yes	103	**87**	111	**93.3**
	No	16	13	8	6.7
	Total	119	100	119	100.0
11. Snack at office?	Yes	48	**40**	54	**45.4**
	No	71	60	65	54.6
	Total	119	100	119	100.0
12. How often do you add salt to your food right before you eat it or while you are eating it?	Never	59	50	75	63.0
	Sometimes	11	9	8	6.7
	Always	49	**41**	36	**30.3**
	Total	119	100	119	100.0
13. How often do you eat ultra-processed food?	Never	27	23	40	33.6
	Daily	24	**20**	8	**6.7**
	Twice a week	68	57	71	59.7
	Total	119	100	119	100.0
14. How often do you eat preserved/ canned salty products?	Never	32	27	54	45.4
	Daily	17	**14**	5	**4.2**
	Twice a week	70	59	60	50.4
	Total	119	100	119	100.0
15.How often do you take homemade high salt containing food like chutney, pickle, chunda, etc.?	Never	39	33	48	40.3
	Daily	16	**13**	7	**5.9**
	Twice a week	64	54	64	53.8
	Total	119	100	119	100.0
16. How often do you take other dairy products having high salt like, processed/packaged cheese, butter, etc.	Never	55	46	58	48.7
	Daily	10	8	4	3.4
	Twice a week	54	45	57	47.9
	Total	119	100	119	100.0
17. How often do you eat fried foods like bhajiya,	Never	35	29	30	25.2
	Daily	6	**5**	1	**0.8**
	Twice a	78	66	88	73.9

samosa, gota and bread pakoda?	week				
	Total	119	100	119	100.0
18. What is the frequency of consumption of maida?	Never	11	9	17	14.3
	Daily	8	7	8	6.7
	Weekly	15	13	25	21.0
	Occasionally	85	71	69	58.0
	Total	119	100	119	100.0

The frequency of consuming fruits daily increased from **36% to 38%** with 32% consuming more than150 grams per day as compared to 18% before intervention. The consumption of vegetables in per day also increased from **47% to 54% (fig.4.9).**

There was a positive impact on dietary habits especially in the consumption of fruits & vegetables-in quantity & frequency.

The frequency of eating meal outside the home daily also decreased from **5% to 2% (fig.4.11).** Those consuming breakfast **(80% to 89%)** & lunch **(87 % to93%)** increased. **Adding extra salt at the table daily also decreased considerably from 41% to 30% (fig.4.10).** Similar result was seen in a study by **Mondal et al (2019)** were there was significant decrease in the consumption of salt daily and increase in intake of fruits and vegetables

F**ig.4.11** shows the effect of intervention on the consumption of ultra-processed foods, preserved / canned products, highly salted food items, dairy products and fried food items. The daily consumption of these reduced considerably **(Table4.10 b).**

Fig. 4.9: Impact of intervention on Fruits & Vegetable consumption

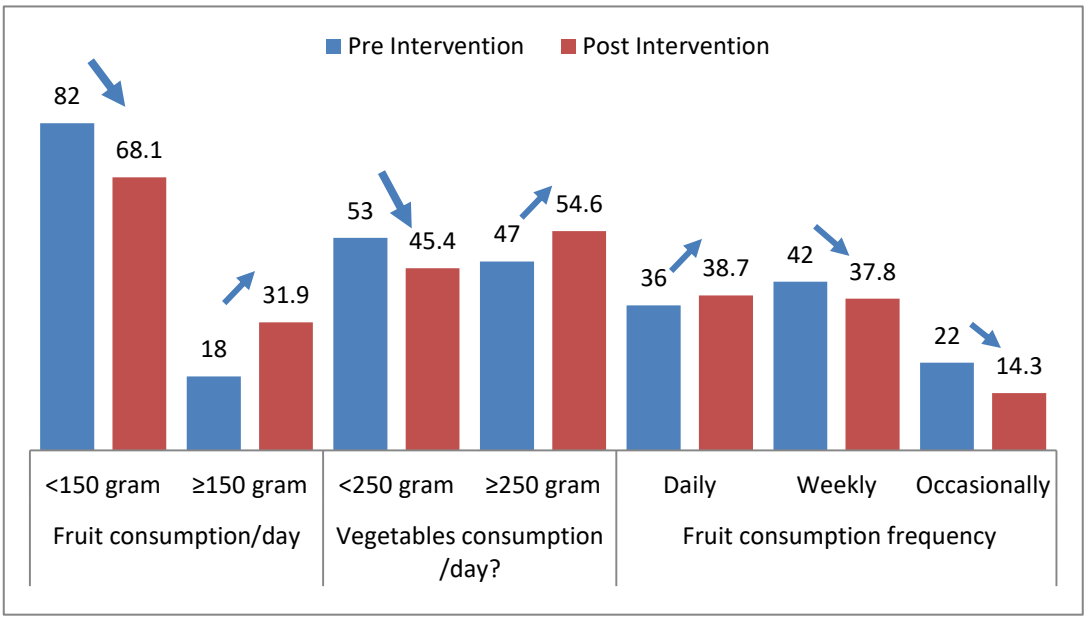


Fig. 4.10: Impact of intervention on breakfast, lunch, snacks at office & extra salt consumption

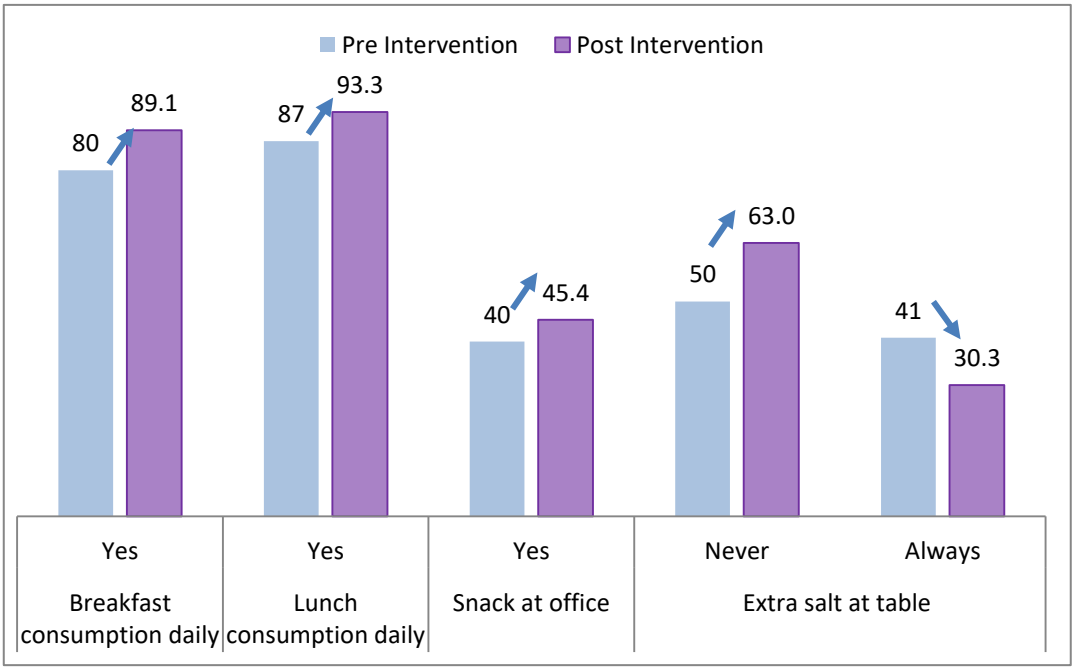


Fig. 4.11: Impact of intervention on frequency of eating unhealthy foods

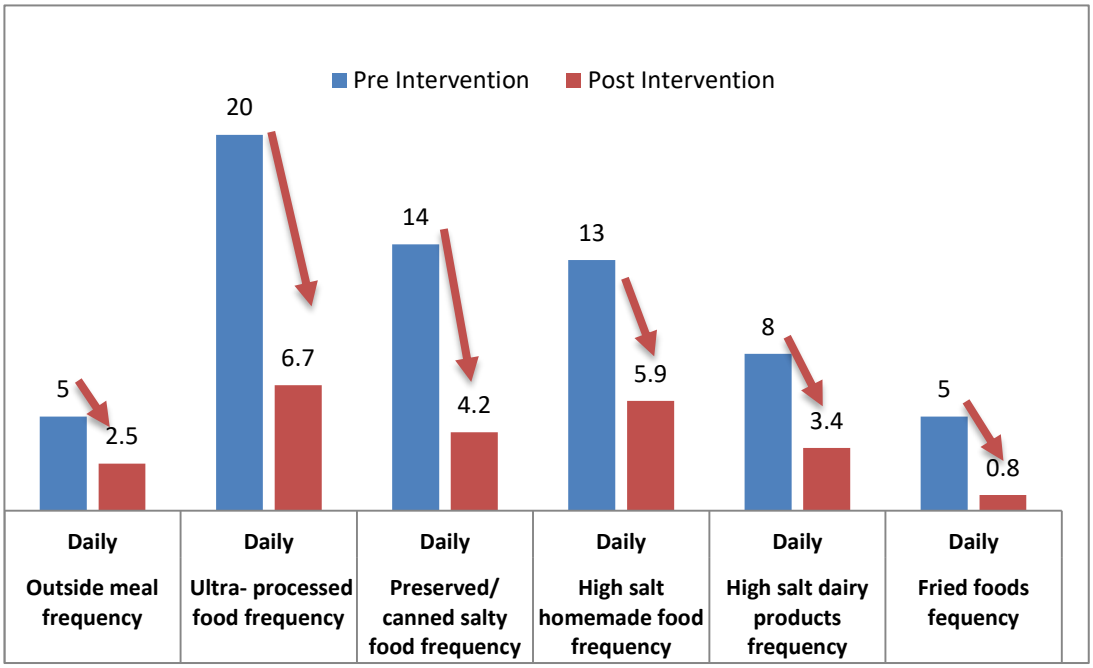


Table: 4.10(c) Comparison Physical Activity & Sedentary lifestyle before and after intervention among university employees

Physical Activity & Sedentary lifestyle		Pre-Intervention		Post-Intervention	
		N	%	N	%
19. Daily do you walk for 10minutes or use a bicycle for at least 10 minutes continuously to get to and from places?	Yes	89	**75**	109	**91.6**
	No	30	25	10	8.4
	Total	119	100	119	100.0
20. If yes, a week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Never	30	25	10	8.4
	Daily	70	**59**	84	**70.6**
	Once a week	6	5	6	5.0
	Twice a week	4	3	5	4.2
	Thrice and more than thrice a week	9	8	14	11.8
	Total	119	100	119	100.0
21. In a week, if you walk or bicycle, how much time do you spend walking or bicycling (write hours/minutes)? (min)	No	30	25	10	8.4
	<180 Minutes	21	**18**	44	**37.0**
	≥180 Minutes	68	57	65	54.6
	Total	119	100	119	100.0
22. Do you do any	Yes	19	**16**	32	**26.9**

vigorous-intensity sports, fitness or a recreational (leisure) activity that causes large increase in breathing or heart rate like [running /badminton/football] for at least 10 minutes continuously?	No	100	84	87	73.1
	Total	119	100	119	100.0
23. If yes, in a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Never	100	84	87	73.1
	Daily	7	**6**	15	**12.6**
	Once a week	7	6	6	5.0
	Twice a week	4	3	3	2.5
	Thrice and more than thrice a week	1	1	8	6.7
	Total	119	100	119	100.0
24. On a typical day that you do vigorous – intensity sports, fitness or recreational (leisure) activities how much time do you spend on these activities (write hours/minutes)?	No	100	84	87	73.1
	<180 Minutes	5	**4**	20	**16.8**
	≥180 Minutes	14	12	12	10.1
	Total	119	100	119	100.0
25. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, and volleyball] for at least 10 minutes continuously?	Yes	40	**34**	60	**50.4**
	No	79	66	59	49.6
	Total	119	100	119	100.0
26. If yes, in a typical week, how many days do you do moderate-intensity sports, fitness or recreational activities?	Never	79	66	59	49.6
	Daily	19	**16**	28	**23.5**
	Once a week	14	12	13	10.9
	Twice a week	3	3	9	7.6
	Thrice and more than thrice a week	4	3	10	8.4
	Total	119	100	119	100.0

27. On a typical day that you do moderate intensity sports, fitness or recreational activities how much time do you spend on these activities (write hours/minutes)?	No	79	66	59	49.6
	<180 Minutes	20	**17**	44	**37.0**
	≥180 Minutes	20	17	16	13.4
	Total	119	100	119	100.0
28.How many hours do you sleep at night?	8 Hrs. & above	33	**28**	31	**26.1**
	6-7 Hrs.	66	55	74	62.2
	<6 Hrs.	20	17	14	11.8
	Total	119	100	119	100.0
29. Do you sleep daily in the afternoon?	Yes	15	13	15	12.6
	No	104	87	104	87.4
	Total	119	100	119	100.0
30.If yes, than how many hours do you sleep?	Not sleep	104	87	104	87.4
	<1 Hrs.	10	8	7	5.9
	1-2 Hrs.	4	3	8	6.7
	>2 Hrs.	1	1	0	0.0
	Total	119	100	119	100.0
31. Do you do any kind of exercise (yoga, walking or any other) early morning?	Yes	56	**47**	63	**52.9**
	No	63	53	56	47.1
	Total	119	100	119	100.0
32. Do you do any kind of exercise (yoga, walking or any other) in evening?	Yes	58	**49**	85	**71.4**
	No	61	51	34	28.6
	Total	119	100	119	100.0
33. After dinner (at night) what do you do?	Go for walk	51	**43**	67	**56.3**
	Sit & watch TV	64	**54**	47	**39.5**
	Go directly to sleep	4	3	5	4.2
	Total	119	100	119	100.0
34. How long do you sit continuously in the chair in office?	<2 Hrs.	53	45	46	38.7
	2-4 Hrs.	30	25	40	33.6
	5 Hrs & above	36	30	33	27.7
	Total	119	100	119	100.0
35. How much time do you spend watching television?	Never	19	16	20	16.8
	1-4 Hrs.	66	55	58	48.7
	>4 Hrs.	5	4	2	1.7
	Occasionally	29	24	39	32.8
	Total	119	100	119	100.0
36. How much time do you spend working on	Never	36	30	33	27.7
	<4 Hrs.	43	36	40	33.6

computer?	4 Hrs. & above	40	34	46	38.7
	Total	119	100	119	100.0
37. How much time do you spend playing games in mobile / tablet?	Never	83	70	85	71.4
	<3 Hrs.	31	26	30	25.2
	3 Hrs. & above	5	4	4	3.4
	Total	119	100	119	100.0
38. How much time do you spend talking with friends or doing other sitting activities like writing and reading newspaper etc.?	Never	36	30	20	16.8
	<2 Hrs.	78	66	85	71.4
	2 Hrs. & above	5	4	14	11.8
	Total	119	100	119	100.0

It was seen that the number of participants who started walking / bicycling for at least 10 minutes increased **(75% to 91%)** greatly and **70.6%** of them started doing this activity daily as compared to **59%** pre intervention **(fig.4.12).** There was an increase in the **(16% to 27**%) in number of participants, who started doing vigorous intensity exercises and those who did it daily doubled **(fig.4.13).**There was also an increase in the number of participants who did moderate-intensity sports/exercises **(34% to 50%)** and **23%** of them did it daily as compared to **16%** pre intervention **(fig.4.14).**

Sleeping patterns of participants showed that there was decrease in sleeping hours. Those who slept for more than eight hours decreased from **28% to 26%,** probably using that time for exercises or some sort of physical activity**.** The percentage of participants performing morning exercises increased from **47% to 53%** and those doing exercises in the evening increased from **49% to 71%.** Evening time was more convenient for working people **(fig.4.15)** to spend time on their physical activity**.** The intervention has impacted even those who preferred to sit and relax after dinner. The data showed an increase **(43% to 56%)** in the number of participants who started walking after dinner. The employees who used to sit and watch T.V. decreased from 54% to 39%, probably indicating that they might have switched over to walking after dinner **(fig.4.16) & (table: 4.10.c).**

Fig. 4.12: Impact of intervention on walking/bicycling for atleast 10 minutes.

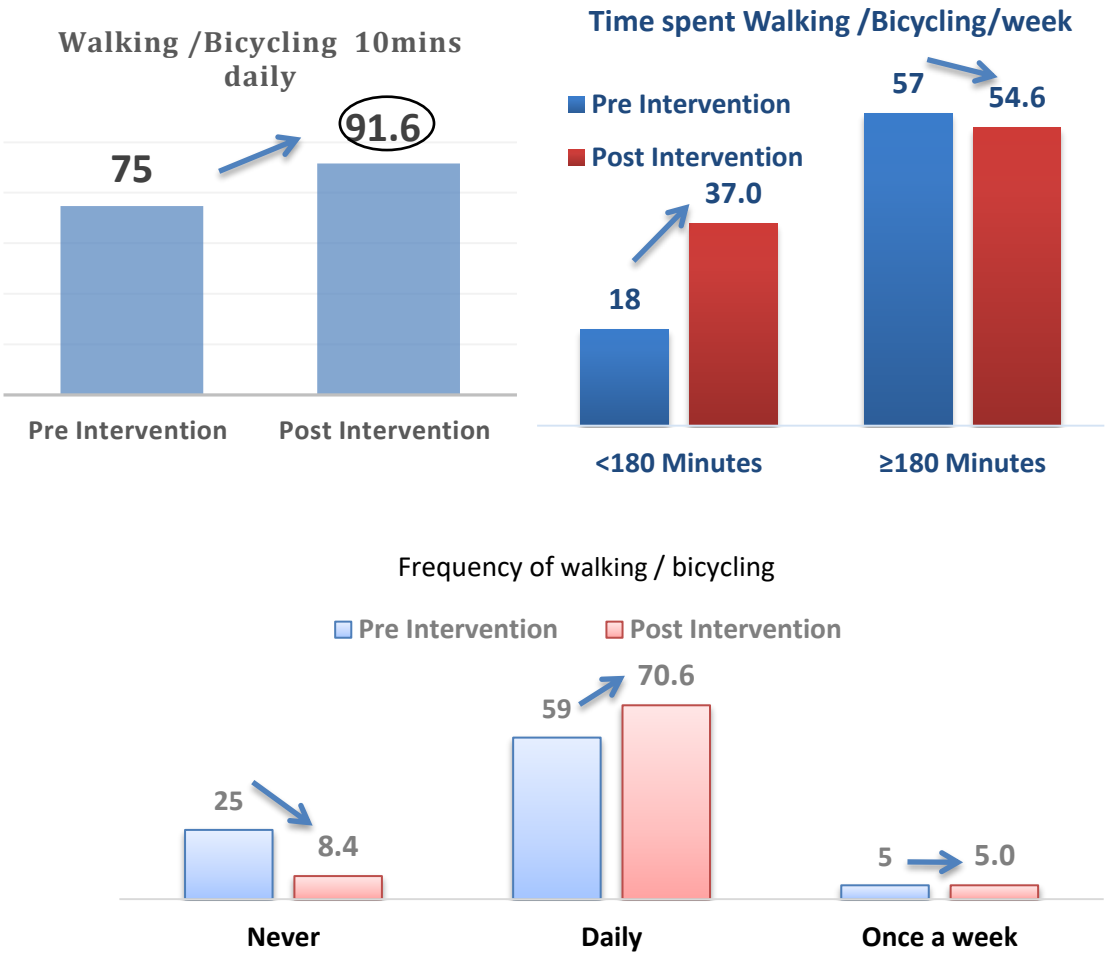
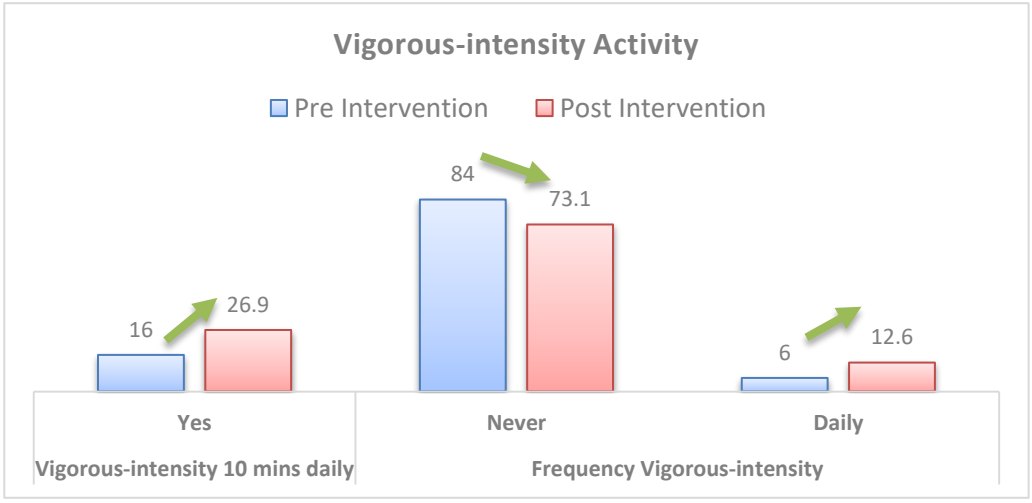


Fig. 4.13: Impact of intervention on doing Vigorous-Intensity Activity



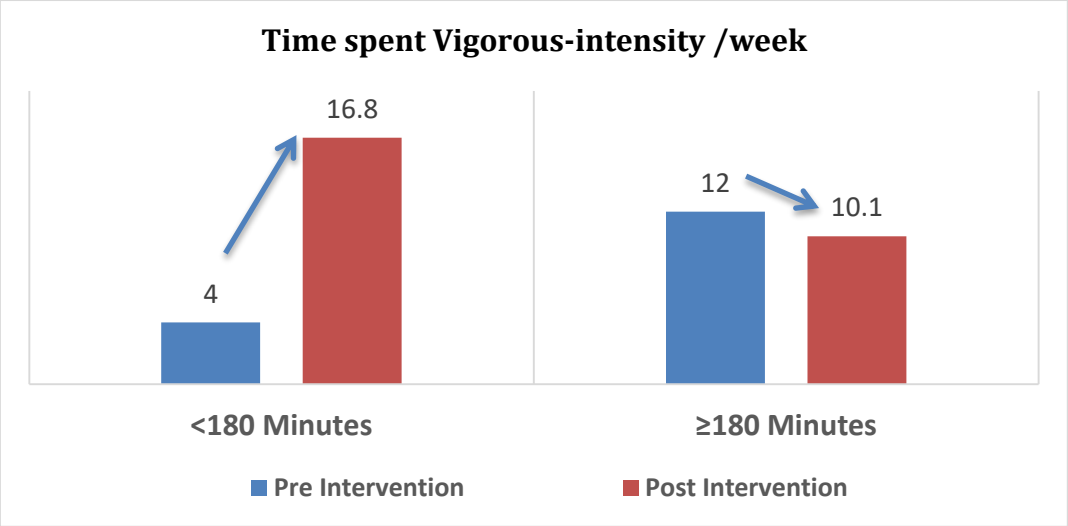


Fig. 4.14: Impact of intervention on doing Moderate-Intensity Activity

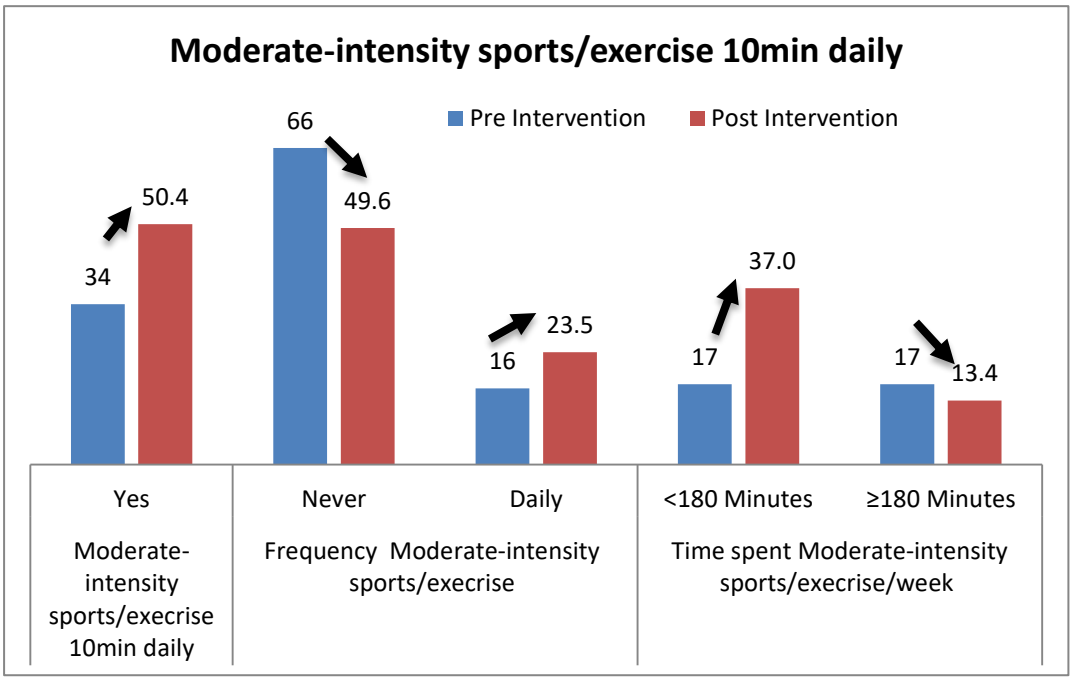


Fig. 4.15: Impact of intervention on Sleeping pattern & Exercises

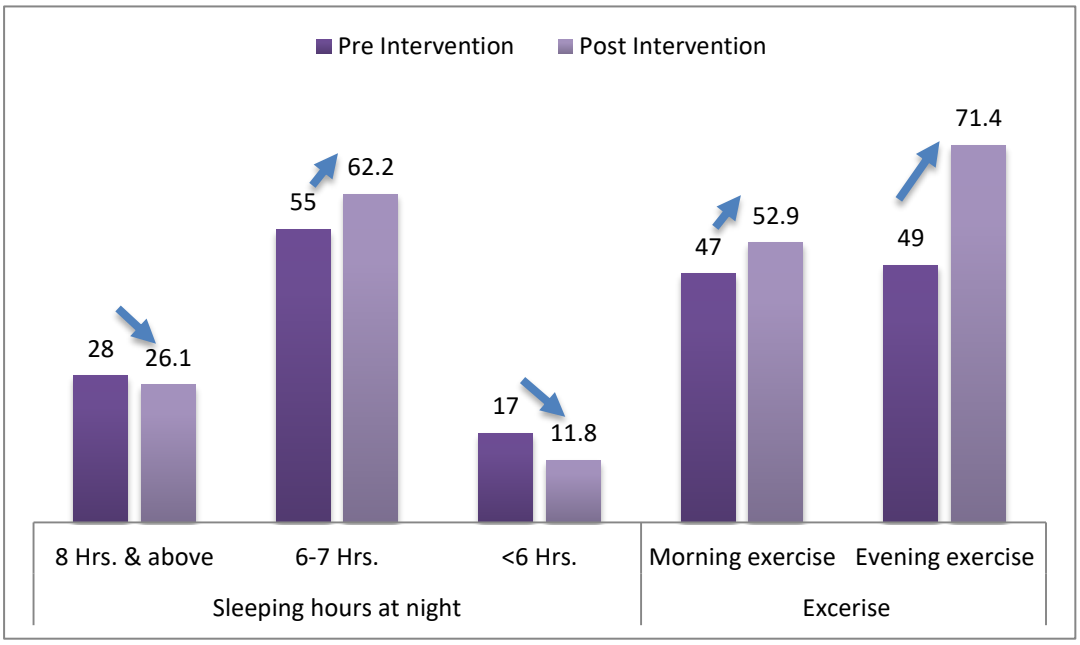


Fig. 4.16: Impact of intervention on Activity after dinner & in office

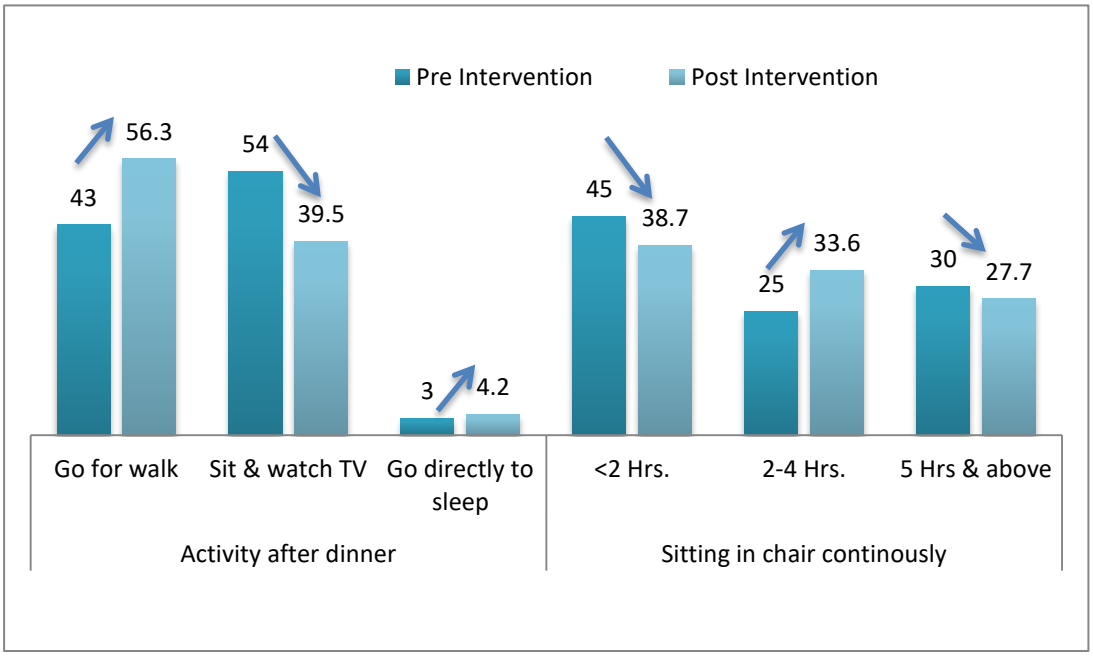


Table: 4.11 Paired Sample Test showing the impact of Intervention on Knowledge on NCDs

Score on Knowledge on NCDS and Risk factors	Pre-Intervention		Post-Intervention		Paired Differences					t	df	Sig.
					Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
	Mean	SD	Mean	SD				Lower	Upper			
Knowledge on NCDs	51.51	20.94	70.84	16.70	-19.33	27.39	2.51	-24.30	-14.35	-7.70	118	0.000
Knowledge on Diabetes	57.31	22.89	74.05	13.54	-16.74	23.86	2.19	-21.07	-12.41	-7.65	118	0.000
Knowledge on Cancer	44.08	26.08	69.98	15.83	-25.91	28.26	2.59	-31.04	-20.78	-10.00	118	0.000
Knowledge on Respiratory Diseases	46.17	29.44	71.74	16.58	-25.57	30.82	2.83	-31.16	-19.97	-9.05	118	0.000
Knowledge on Obesity	38.78	32.21	60.38	25.87	-21.60	38.60	3.54	-28.61	-14.60	-6.11	118	0.000
Knowledge on Heart Disease	32.28	25.32	66.04	19.77	-33.76	30.38	2.78	-39.27	-28.25	-12.12	118	0.000
Knowledge on Physical Activity	39.03	26.47	67.49	17.84	-28.46	32.03	2.94	-34.28	-22.65	-9.69	118	0.000
Knowledge on Healthy Diet	38.14	28.20	68.99	15.65	-30.85	31.83	2.92	-36.62	-25.07	-10.57	118	0.000
Overall, Knowledge on NCDs and Its Risk	40.53	22.71	69.59	13.57	-29.06	25.31	2.32	-33.65	-24.47	-12.53	118	0.000

- A paired sample t-test showed that the employees' perceived knowledge on fundamentals on NCDs increased significantly (t = -7.70, p < .001) from pre-intervention (M = 51.51, SD = 20.94) to post-intervention (M = 70.84, SD = 16.70).

- Similarly, the employees' perceived knowledge on diabetes increased significantly (t = -7.65, p < .001) from pre-intervention (M = 57.31, SD = 22.89) to post-intervention (M = 74.05, SD =13.54).

- From pre-intervention (M =44.08, SD =26.08) to post-intervention (M = 69.98, SD =-10.00), the employees' perceived knowledge on cancer increased significantly (t = -15.83, p<.001).

- The employees' knowledge on respiratory diseases also increased significantly from pre-intervention (M = 46.17, SD = 29.44) to post-intervention (M = 71.74, SD = 16.58) (t = -9.05, p<.001).

- The paired sample t-test revealed that the employees' perceived knowledge on obesity significantly increased (t =-6.11, p <.001) from pre-intervention (M = 38.78, SD = 32.21) to post-intervention (M = 60.38, SD = 25.87).

- Correspondingly, employees' perceived knowledge on heart diseases increased significantly (t = -9.69, p <.001) from pre-intervention (M = 32.28, SD = 25.32) to post-intervention (M = 66.04, SD = 19.77).

- The employees' interpreted knowledge on physical activity also increased significantly from pre-intervention (M = 39.03, SD = 26.47) to post-intervention (M = 67.49, SD = 17.84) (t = --9.69, p<.001).From pre-intervention (M =38.14, SD =28.20) to post-intervention (M = 68.99, SD =15.65), the employees' perceived knowledge on healthy diets also increased significantly (t = -10.57, p<.001).

- **Summing up on the overall knowledge on NCDs and its risk factors, it was statistically significant (t=-12.53, p<.001) that the employees' knowledge had increased from pre-intervention (M = 40.53, SD = 22.71) to post-intervention (M=69.59, SD = 13.57) [table: 4.11].**

Table: 4.12 Paired Sample Test showing the impact of Intervention on clinical and anthropometric characteristics

	Pre-Intervention		Post-Intervention		Paired Differences					t	df	Sig. (2-tailed)
					Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
	Mean	SD	Mean	SD				Lower	Upper			
BMI (m2)	26.56	4.42	26.42	4.27	0.14	0.95	0.09	-0.03	0.32	1.63	118	0.107
WHR/Waist Hip ratio	0.96	0.16	0.96	0.16	-0.01	0.02	0.00	-0.01	0.00	-2.75	118	0.007
Systolic BP (mmHg)	**139.56**	**18.76**	**133.97**	**17.53**	**5.59**	**15.82**	**1.45**	**2.72**	**8.46**	**3.85**	**118**	**0.000**

The impact of intervention was not seen in BMI and waist hip ratio i.e. no significant changes were seen in BMI and WHR whereas there was a significant change in the systolic blood pressure values. Longer period of intervention is necessary to see significant changes in these parameters **(Table:4.12). Jessica Macedo et al (2021)** found that health worker training and patient health education interventions reduced blood pressure and HbA1c levels in rural Northeast Brazilian municipality patients with diabetes and hypertension.

Parashar et al (2022) conducted behaviour change interventions regarding the four main NCD risk factors of physical inactivity, unhealthy diet, excessive alcohol consumption and tobacco use with the help of trained non-physician health workers and found improvement in the mean blood pressure levels and increase in the proportion of patients with controlled blood pressure levels. There was also reduction in tobacco and alcohol intake, increase in consumption of a heart-healthy diet and increase in regular physical activity. The present study also gives similar results.

Wangchuk et al in there study concluded that early identification and treatment of people with NCDs or at high risk for developing them can lessen their complications, increasing survival and quality of life**.** Interventions in their study were conducted in Korea and Bhutan using WHO

PEN by non-physician health workers and household doctors leading to improvements in behavioural risk factors as well as clinically significant improvements in blood pressure, blood glucose control and 10-year CVD risk factors **(Wangchuk, D. et al., 2014; Hyon, C. S. et al., 2017).**

Summary & Conclusion

SUMMARY AND CONCLUSION

Majority of the participants in this study population were married and had sound education and hence continued emphasis on such health intervention with regular monitoring & update, can bring about good positive results towards behavior change. Since most of the families are nuclear with less than five members, decisions regarding purchase and consumption of healthy food becomes easier.

The participants were in their mid-age 47.08±8.80years which is a crucial period for manifestation of NCDs and also crucial with respect to family responsibilities and career goals and hence more rigorous efforts are needed to control and prevent it. The non-teaching staff were more cooperative and interested in improving their health compared to the teaching staff.

Considering the mean values of biochemical parameters, the population seemed **not at risk of** NCDs with respect to their lipid profile as the mean values of all parameters, namely, total cholesterol, triglycerides, LDL-C were below the borderline values. Even the mean HbA1c levels demonstrated the population was not at risk of diabetes.

The risk factor of NCDs was very much prevalent in the population with respect to obesity (BMI> 22.9 kg/m^2) and abdominal obesity (values of WC & WHR more than the cut-offs). **Obesity was the main cause of concern.** Women participants posed a higher risk of NCDs as far as obesity & abdominal obesity was concerned.

Women had good HDL-C values compared to men.

The indicators for diabetes (fasting plasma glucose & HbA1c) also showed normal values in both men & women thereby concluding that they **may not be at risk** of it as of now. **According to WHO report males had a higher chance of dying from an NCD than females in all WHO regions (WHO Country profile, 2018).**

At baseline, all participants who were ≤ 35 years had poor knowledge on NCDs, heart diseases & healthy diets whereas those above 55 years had good knowledge on diabetes & heart diseases but poor knowledge on physical activity. Men had very poor knowledge on diabetes & cancer but not statistically significant. **Women had better**

knowledge than men in all topics, namely NCDs, diabetes, heart diseases, chronic respiratory diseases, cancer, physical activity & healthy diets and it was statistically significant in all the topics. Teaching employees had higher knowledge than non-teaching employees ($p<0.05$) and education was statistically significant for knowledge in preventing and controlling NCDs.

The frequency of the subtance abuse was less in the population.

82% of the participants were consuming less than 150 grams of fruits and 53% were consuming less than 250 grams of vegetables in a day as against 400 grams (i.e. five portion) of fruits and vegetables recommended by WHO in a day .

20% never took breakfast and 13% never took lunch.40%of the population were in the habit of consuming snacks in the office.41% of the participants always added salt at the dinner table.

59% of the participants walked/ bicycled daily for ten minutes and 57% of them did more than 180 minutes per week. 34% and 16% participants performed moderate-intensity & vigorous-intensity exercises respectively. The WHO recommends 75-150 minutes of vigorous-intensity exercises and 150-300 minutes of moderate-intensity exercises and sports per week.

55% of the study population slept for 6-7 hours at night and 47% & 48% of the employees did exercises or yoga daily in morning & evening respectively. 30% used to sit continuously in the chair for more than five hours.

No significant changes were seen in BMI, WHR & lipid profile after intervention whereas there was a significant change in the systolic blood pressure values.Longer period of intervention is necessary to see significant changes in these parameters.
There was a decrease in the number of participants who were diabetic with respect to HbA1c values from 28.6% to 22%.
Overall knowledge of NCDs and their risk factors increased significantly among university employees, from very poor (27% to 0%) and poor (33% to 7%) to average (33% to 58%) and good (5% to 34%).
There was a positive impact on dietary habits especially in the consumption of fruits & vegetables-in quantity & frequency. **Adding extra salt at the table daily also decreased considerably from 41% to 30%.** The effect of intervention on the

consumption of eating meals outside home, ultra-processed foods, preserved / canned products, highly salted food items, dairy products and fried food items, reduced considerably on a daily basis.

Participants who started walking / bicycling for at least 10 minutes increased **(75% to 91%)** greatly and **70.6%** of them did it daily walking / bicycling. The percentage of participants performing moderate-intensity sports/exercises increased from **34% to 50%** and daily number increased from **16% to 23%**. The percentage of participants performing morning and evening exercises also increased.

Though the study was on a small group and for short period of time there was considerable increase in knowledge & change in attitude & practice probably because all the participants in the study were at risk of NCDs or its risk factors and were concerned with their health.

Personal observations:

Behaviour change communication is a very tedious, long drawn out process both for the trainer & the respondents.

It needs a strong will to focus on things which were not habits and does not come voluntarily especially when it is regarding one's own health. The priority for personal health & well-being takes the last preference. The non-teaching staff found it easier to devote time for pursuing diet modifications and increasing physical fitness whereas the teaching staff were having tight schedule throughout especially the young teaching staff. They were finding it difficult to cope up with their official duties and responsibilities and could not pay attention to their own needs or needs of their families. Many participants were stubborn and indignant to change. Repetitive coaxing & counseling was needed to make than understand the importance of going for regular blood check-ups.

It was a herculean task to get personal appointment from participants even if it was for their own health & benefits.

Everybody wanted to be in good health but not willing to pay the price of sacrificing favorite unhealthy foods or making time foe exercises & physical activity. Having better knowledge or education is insignificant if personal health is not given priority.

It is easier and better to change habits/behaviours when young.

Feedback in Verbatim form

Individually there was very good positive response from participants. The weekly power point presentations & videos for exercises and fitness were highly appreciated by all of them and continuous reminders early morning every day through WhatsApp social media motivated them to wake-up early and start the day with exercises. Some of the feedbacks are as follows:

Prof. (Dr.) Avani Maniar said "that the detailed diet plan is going to be very helpful for me to keep control on my blood sugar levels. Such studies are really helpful in prevention as well as management of NCDs. Congratulation madam for completing this study successfully. Blessings to Reema in helping the University staff for much-needed cause".

Prof. (Dr.) Shonima Venugopal said "It gives me immense pleasure to have been a part of a research project helmed by Annie ma'am (Prof. Annie Kuruvilla) with whom I have been associated for the last 20 plus years. The research work impressed me with the meticulous approach in data collection and the intervention study while comprehensively paying attention to details .This research work offers scope to improve the health of university employees and through them the society and for the same I laud the expert guidance that has gone to get this research work implemented. I offer my gratitude for having included me in this work and helping me lower my blood pressure levels. I am confident that works such as these will help open doors to miracles for mankind at large".

Prof. (Dr.) Anjali Jivani said "Thank you very much Annie Ma'am and Reema for the detailed study on NCD- especially diabetes! Your detailed power point presentations and dietary related material were very, very informative and useful. Reema did a wonderful job of diet plan for me. I was fortunate to be part of this study. In fact I'm missing your morning messages of getting up and doing exercises. The best part was that my HbA1c reduced from 6.4 to 5.8".

Ms. Anindita Bhattacharya said "It was helpful in achieving my health goal & very interesting study. My HbA1c reduced from 8.76 to 7.8 as per Annie ma'am and Reema Patel's guidance. All The Best".

RECOMMENDATIONS

- **In line with the SDGs, this initiative was an attempt for effective NCD prevention and treatment.**

  To meet the global goal of 25% reduction in mortality rate from these four major NCDs by 2025 and the sustainable development goal of 30% reduction by 2030, effective NCD prevention and treatment interventions must be implemented **(WHO, Global Action Plan, 2013)**
- *As per WHO recommendations to 'Implement mass media campaign on healthy diets, including social marketing to reduce the intake of total fat, saturated fats, sugars, and salt; and to promote the intake of fruits and vegetables',* it is hereby recommended to implement social media campaigns on war footing to promote healthy lifestyle
- It is noticed that there was increase in participants taking snack at office and hence it is important to provide a 'healthy- choice- environment' to nudge them in the right direction, hereby suggesting all canteens in the university to be providing healthy snacks and meals.
- Employees should be motivated for physical activity during working hours proving them with a range of options in their immediate vicinity.
- Healthy choice should be the easy choice within the institutional environment and hence efforts should be taken by the university administration to ensure the same.

LIMITATIONS OF THE STUDY

- The participants may not be representative of the total university population.
- Only those who had been detected with NCDs & its risk factors from the previous year's (2021-22) study were enrolled in this study.

- Neglecting the many biases in the study namely-sampling bias, knowledge bias, self -reported bias, still the study is valid because of its significance in increasing knowledge.

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Appendices

APPENDIX I

Plagiarism Certificate

Curiginal

Document Information

Analyzed document	REEMA THESIS -1.docx (D163975085)
Submitted	2023-04-14 18:31:00
Submitted by	Prof. Komal Chauhan
Submitter email	komal.chauhan-fn@msubaroda.ac.in
Similarity	0%
Analysis address	komal.chauhanfn.msub@analysis.urkund.com

APPENDIX II

Ethical Certificate

Institutional Ethics
Committee for Human
Research
(IECHR)

FACULTY OF FAMILY AND COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

Ethical Compliance Certificate 2022 – 2023

This is to certify that Ms. Reema Patel's study titled, "**Intervention to Control Noncommunicable Diseases & its Risk Factors among University Employees**" from Department of Foods and Nutrition has been approved by the Institutional Ethics Committee for Human Research (IECHR), Faculty of Family and Community Science, The Maharaja Sayajirao University of Baroda. The study has been allotted the ethical approval number **IECHR/FCSc/MSc/2022/37.**

Prof Mini Sheth
Member Secretary
IECHR

Prof Shagufa Kapadia
Chairperson
IECHR

APPENDIX III
For Permission letter

University Health Centre
The Maharaja Sayajirao University of Baroda
Opp. Rosary School, Pratapgunj Vadodara – 390 002.Gujarat. India.
Tel: +91 0265-2792

UHC/ 112

Date : 13/08/2021

To
The Registrar (ADM)
The Maharaja Sayajirao University of Baroda
University Office
Fatehgunj, Vadodara-390002

Sub: Risk Factor Profile for Non Communicable Diseases among University Employees- Teaching & Non-Teaching

Dear Sir

This is to inform you that we as a group i.e. the Medical Centre, the Physical Education department & the Foods & Nutrition department would like to do a study on 'Risk Factor Profile for Non Communicable Diseases among University Employees- Teaching & Non-Teaching. In fact this was also the suggestion from our honorable Vice Chancellor Prof. PadmalVyas.

A tool (questionnaire) prepared and will have to be implemented for which we need your permission to interview and include participants from the teaching as well as non-teaching community of the University (only those who are willing and give consent).

The study includes collecting information by the different departments on

1. Behaviour risk factors, Anthropometry (height, weight, obesity, BMI etc.)- **FN Dept.**
2. Biochemical profile (blood pressure, blood sugar, lipid profile etc.) & flexibility & motor fitness test (under supervision of physiotherapist at the University Health Centre)- **University Health Centre**
3. Cardio Vascular endurance test- **Physical education department**

This is to request you to please give us permission to visit the faculties of the University and approach all the Deans, to facilitate this study.

Since the office staff also is included in the study, it is all the more necessary to inform all Deans about this.

If a permission letter is received from your esteemed office, it would be of great help to proceed with the study.

Thanking you

Dr. Sapna Mishra

APPENDIX IV
Permission letter from Registrar

The Maharaja Sayajirao University of Baroda
Fatehgunj, Vadodara – 390 002, Gujarat, INDIA
Tel. Ph.: (+91-0265) • (Registrar): 2795521 • (DO/GCU/Audit/Academic): 2793735 • (IA/CAO): 2795506
• (Dy.R. Exam): 2795502 • (Dy.R./AR ADE): 2792032 • (Dy.R. ADM/ADE): 2784062 • (Engineer): 2795512

No. ADM/3/ 152 Date :23 -08-2021

To,
Dr. Sonal Mishra
Medical Officer,
University Health Centre,
The Maharaja Sayajirao University of Baroda,
Vadodara

Subject : Permission to study on Risk Factor Profile for Non Communicable Disease among University Employee (Teaching and Non-Teaching) jointly to be conducted by University Health Centre, Food & Nutrition Department & Physical Education Department.

Reference : Your letter No. UHC / 110 & 112 dated 13/08/2021.

Madam,

With reference to above, I am directed to inform you that you are permitted to conduct study on Risk Factor Profile for Non Communicable Disease among University Employee (Teaching and Non-Teaching) to be conducted jointly by University Health Centre, Food & Nutrition Department & Physical Education Department with condition that there will not be any financial liability on the part of the University and observance of Covid 19 Guideline of GOG.

The list of the Teaching & Non-Teaching staff of the University will be provided to you by the ADE Section of the University as requested.

Kindly take necessary action accordingly.

Thanking You,

Yours Sincerely,

23/8/2021

Dy. Registrar
For Registrar(Offg.)

23/8/2021

Copy to :-
1. PS to Vice-Chancellor/ Registrar
2. The Head, Department of Foods and Nutrition, Faculty of Family & Community Sciences.
3. I/c Director, Department of Physical Education
4. Sections A/ Audit/ ADE.

APPENDIX V
Research Grant from University

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA
Maharaja Fatehsinghrao Gaekwad Road, Fatehgunj, Vadodara – 390 002, Gujarat, INDIA
Tel. Ph.: (+91-0265) • (Registrar): 2795521 • (DO. GCU): 2793735 • (IA & CAO): 2795506
• (Dy. R. Exam): 2795502 • (Dy. R. ADE/ADM): 2792032 • (ADE/ADM): 2784062 • (Engineer): 2795512

No. GCU/RCC/2021-22/32-32/520 Date: 8 FEB 2022

To,
Dr. Sonal Misra
Medical Officer
University Health Centre
The Maharaja Sayajirao University of Baroda
Vadodara

Sub: Research Project sanctioned under the 'University Supported Research Projects' for the year 2021-2022

Ref: 1. Research proposal Notification No. RCC/2021-2022/260 dated 25-8-2021
2. Extension of Research proposal Notification No. RCC/2021-2022/320 dated 4-10-2021
3. SR. No. 22 Dated 31/1/2022

Dear Dr. Sonal Misra

In response of the research proposals invited vide letter under reference (I) & (II), the research project entitled **"Risk Factor Profile and Analysis for Non Communicable Disease in University Employees"** is hereby sanctioned to you at a total cost Rs. 1,00,000/- for a period of ONE YEAR from 1st February 2022, vide SR No. 22 dated 31/1/2022.

You, Dr. Sonal Misra, Principal Investigator, Medical Officer and Prof. Annie Kuruvilla, Principal Investigator, Dept. of Foods & Nutrition of the project shall be responsible for proper implementation and submission of statement of accounts, and other related documents as and when required by the University. To facilitate this office to take prompt action, please quote the Reference no. of this letter in each and every correspondence (including bills) related to this project. University rules of expenditure that includes procurement, travel, remuneration etc., shall be applicable as for the projects funded by UGC/DST/ICSSR/AICTE etc.

- The final technical /annual report along with Statement of Expenditure should be prepared by the PI and the same shall be submitted to the University with a copy to the Internal Quality Assurance Cell and RCC after the completion of the project. University expects at least one publication in International/National journal of repute along with the conference/seminar presentation. The grant received from the University under the scheme should be duly acknowledged in the publications.
- Statement of final accounts showing receipts and expenditure and a list of articles (consumables and non-consumables) left over at the time of completion of the project and purchased out of the project funds shall be transferred to the Department stock register and will be the property of the Department/University.
- University Accounts Section shall maintain all accounts and PI is not supposed to open any Bank Account.
- University shall release 50% of the total sanction as advance to the PI in his/her salary account for initiation of the project. Principal Investigator to submit the salary account details (clear copy of Pass Book) to the undersigned by 15/2/2022 positively.
- After submitting the Final Statement of Accounts and the progress Report, the balance amount shall be reimbursed to the PI.
- All the purchases under this project will have to be done by strictly following the university procedures including the GEM.
- Books which are not available in HM Library are only allowed to be purchased. Journals/papers/articles should be down loaded and printed them in spiral-bind form.

Yours Sincerely

Development Officer

Copy to:-

1. Dean, Faculty of Family and Community Sciences
2. Head, Dept. of Foods & Nutrition, Faculty of Family and Community Sciences
3. Prof. Annie Kuruvilla, Principal Investigator, Dept. of Foods & Nutrition, Faculty of Family and Community Sciences
4. Director, IQAC – for information and record
5. PS to Vice-Chancellor/Registrar/offg.)
6. Section Account/Audit

OFFG. DEAN
FACULTY OF FAMILY AND COMMUNITY SCIENCES
VADODARA

APPENDIX VI (A)
Consent Form (English)

DEPARTMENT OF FOODS AND NUTRITION
FACULTY OF FAMILY & COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA
VADODARA 390 002- INDIA

EMPLOYEE CONSENT FORM

Consent form for participants in a research project entitled:

INTERVENTION TO CONTROL NCDs (Non-Communicable Diseases) & NCD RISK FACTORS AMONG UNIVERSITY EMPLOYEES

This study is a part of the continuing research project on 'RISK FACTOR PROFILE FOR NCDs (Non-Communicable Diseases) IN UNIVERSITY EMPLOYEES'. This year we, Dr. Sonal Mishra, Prof. Dr. Annie Kuruvilla and Ms. Reema Patel are following up those employees who are at risk of NCDs.

For this we are requesting you to kindly co-operate with us for this study. The schedule is as follows:

1(A). For the analysis of biochemical parameters, pre and post intervention (twice),the venous blood (3ml)will be taken twice for HbA1c, Lipid profile, fasting blood sugar, by a trained technician and precautions will be taken while drawing the blood, fully under supervision of the University Health Center officials. The participants are chosen purely on a voluntary basis with no monetary obligations. The tests will be done free of cost and the results will be shared with the person concerned for documentation purposes and for further action.

(B) Anthropometric measurements- pre and post measurements of waist & hip circumference, weight, Height, blood pressure will be taken.

2. Group Counseling sessions on topics related to the common NCDs (diabetes & heart disease) and its risk factors (obesity, physical fitness & unhealthy eating practices) will be done twice a month for a period of 3 months.

3. One to one counseling on customized diets (made for each participant personally) and physical activity.

4. Small group meetings, house-house visits and use of change agents(the person responsible for menu and diet).

5. WhatsApp group for continuous monitoring, weekly updates and reinforcement.

All information will be strictly confidential and will not be shared with anyone other than members of my study team.

I_____ hereby give my consent to be included as a subject in the research study to be conducted in the University.

Name: Teaching/ Non-Teaching:
Signature: Department:
Date:
Mobile No.: E-mail:

APPENDIX VI (B)
Consent Form (Gujarati)

DEPARTMENT OF FOODS AND NUTRITION
FACULTY OF FAMILY & COMMUNITY SCIENCES
THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA
VADODARA 390 002- INDIA

માટે સંમતિ ફોર્મ:

યુનિવર્સિટીના કર્મચારીઓમાં એનસીડી (બિનસંચારી રોગો) અને એનસીડી જોખમ પરિબળો ને નિયંત્રિત કરવા માટે હસ્તક્ષેપ

આ અભ્યાસ 'યુનિવર્સિટી કર્મચારીઓમાં NCDs (નોન-કોમ્યુનિકેબલ ડિસીઝ) માટે રિસ્ક ફેક્ટર પ્રોફાઇલ' પર સતત સંશોધન પ્રોજેક્ટ નો એક ભાગ છે. આ વર્ષે અમે, ડૉ. સોનલ મિશ્રા, પ્રો. ડૉ. એની કુરુવિલા અને શ્રીમતી રીમા પટેલ એવા કર્મચારીઓને ફોલોઅપ કરી રહ્યા છીએ જેમને NCD નું જોખમ છે.

આ માટે અમે તમને વિનંતી કરીએ છીએ કે આ અભ્યાસ માટે અમારી સાથે સહકાર આપો. શેડ્યૂલ નીચે મુજબ છે.

1(A). બાયોકેમિકલ પરિમાણોના પૃથ્થકરણ માટે, પ્રશિક્ષિત ટેકનિશિયન દ્વારા HbA1c, લિપિડ પ્રોફાઈલ, ફાસ્ટિંગ બ્લડ સુગર માટે વિનસ બ્લડ (3 મિલી) બે વાર લેવામાં આવશે અને રક્ત લેતી વખતે સાવચેતી રાખવામાં આવશે. યુનિવર્સિટી હેલ્થ સેન્ટરના અધિકારી ની દેખરેખ હેઠળ. સહભાગીઓ કોઈ નાણાકીય જવાબદારીઓ વિના સ્વૈચ્છિક ધોરણે પસંદ કરવામાં આવે છે. પરીક્ષણો વિનામૂલ્યે કરવામાં આવશે અને પરિણામો દસ્તાવેજીકરણ હેતુઓ અને આગળની કાર્યવાહી માટે સંબંધિત વ્યક્તિ સાથે શેર કરવામાં આવશે.

(B) એન્ટ્રોપી મેટ્રિક માપન- કમર અને હિપ પરિધ, વજન, ઊંચાઈ, બ્લડ પ્રેશરનું પૂર્વ અને પછી ના માપ લેવામાં આવશે.

2. સામાન્ય NCDs (ડાયાબિટીસ અને હૃદય રોગ) અને તેના જોખમી પરિબળો (સ્થૂળતા, શારીરિક તંદુરસ્તી અને બિનઆરોગ્યપ્રદ આહાર વ્યવહાર) સંબંધિત વિષયો પર જૂથ પરામર્શ સતત 3 મહિનાના સમયગાળા માટે મહિનામાં બે વાર કરવામાં આવશે

3. વૈવિધ્યપૂર્ણ આહાર (દરેક સહભાગી માટે વ્યક્તિગત રીતે બનાવેલ) અને શારીરિક પ્રવૃત્તિ પર એક થી એક પરામર્શ.

4. નાની જૂથ બેઠકો, ઘર-ઘરની મુલાકાત અને પરિવર્તન એજન્ટોનો ઉપયોગ (મેનુ અને આહાર માટે જવાબદાર વ્યક્તિ).

5. સતત દેખરેખ, સાપ્તાહિક અપડેટ્સ અને મજબૂતીકરણ માટે WhatsApp જૂથ.

બધી માહિતી સખત રીતે ગોપનીય રહેશે અને મારી અભ્યાસ ટીમના સભ્યો સિવાય અન્ય કોઈની સાથે શેર કરવામાં આવશે નહીં.

હું _____ આથી યુનિવર્સિટીમાં હાથ ધરવામાં આવનાર સંશોધન અભ્યાસમાં વિષય તરીકે સમાવવા માટે મારી સંમતિ આપું છું.

નામ: અધ્યાપન/બિન-શિક્ષણ:

હસ્તાક્ષર: વિભાગ :

તારીખ:

મોબાઈલ નંબર: ઈ-મેલ:

APPENDIX VII
Knowledge Questionnaire

DEPARTMENT OF FOODS AND NUTRITION

FACULTY OF FAMILY & COMMUNITY SCIENCES

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

VADODARA 390 002- INDIA

Intervention to Control NCDs & NCD Risk Factors among the University Employees 2022-23:–
Dr. Sonal Mishra, Prof. Annie Kuruvilla & Reema Patel

QUESTIONNAIRE
Knowledge / Awareness on Non Communicable Diseases (NCDs)

Name: _____ Dt._____

Sex: _____ Mobile No._____

Faculty: _____

Department: _____

Teaching/Non-teaching:_____

Address: _____

_____

Please read the question carefully and tick (✓) the right answer.

I Part- A NCDs (Non-Communicable Disease)

1. Cancer is a _____

a) NCD ◯ b) Risk factor of NCD ◯

2. Obesity is a_____

a) NCD ◯ b) Risk factor of NCD

3. Hypertension is a NCD

a) Yes ◯ b) No ◯

4. Diabetes is a _____

a) NCD ◯ b) Risk factor of NCD ◯

5. Is Pneumonia a NCD?

a) Yes ◯ b) No ◯

6. Is chronic respiratory disease a NCD?

a) Yes ◯ b) No ◯

7. Is heart attack a risk factor of NCD?

a) Yes ◯ b) No ◯

8. Healthy diet is necessary to prevent NCDs?

a) True ◯ b) False ◯

9. It is not necessary to be physically active to prevent NCDs?

a) True ◯ b) False ◯

10. If, you ignore NCDs what would be the result?

a) Premature deaths, diabetic complication, poor quality of life ◯

b) Weight loss, wound infection ◯

c) Urinary infection, Constipation ◯

II Part B- Diabetes

11. What are the symptoms of Diabetes?

a) Urinating Often, Slow healing of wounds, increased thirst ◯

b) Slow healing of wounds, breathing problem ◯

c) Itching, rashes ◯

d) Body Pain, weight gain, ◯

12. Which of the following is not the risk factor of Diabetes?

a) Family history ◯ b) Pneumonia ◯

c) Hypertension ◯ d) Physically inactive ◯

13. Is obesity a risk factor of diabetes?

a) Yes ◯ b) No ◯

14. Diabetes can be controlled by healthy diet?

a) Yes ◯ b) No ◯

15. Diabetes can be controlled by physical activity-walking & exercise?

a) Yes ◯ b) No ◯

16. Diabetes can be controlled by ideal body weight?

a) Yes ◯ b) No ◯

17. If you have diabetes, you will not feel thirsty?

a) Yes ◯ b) No ◯

18. One may lose the hair because of diabetes?

a) Yes ◯ b) No ◯

19. One may lose the eye sight because of diabetes?

a) Yes ◯ b) No ◯

20. Nerves in the hands & feet will dysfunction, if you have diabetes?

a) Yes ◯ b) No ◯

21. Which of following fruit should be avoided, if you have diabetes?

a) Apple ◯ b) Watermelon ◯ c) Pear ◯

22. Maida bread is better than wheat bread for diabetes patient?

a) Yes ◯ b) No ◯

23. Methi seeds help to control diabetes?

a) Yes ◯ b) No ◯

24. For fasting blood sugar test there should be gap of _____ after having food?

a) 5-9hrs. ◯ b) 10-12hrs. ◯

c) 2-3hrs. ◯ d) 4-6hrs. ◯

25. HbA1c test gives the average value of blood glucose level for corresponding_____?

a) 6 months ◯ b) 3 months ◯

c) 12 months ◯ d) 1 months ◯

26. Oats is good for diabetes?

a) Yes ◯ b) No ◯

27. Stress is a reason for diabetes?

a) Yes ◯ b) No ◯

28. What are the complications of Diabetes?

a) Vision Problem ◯

b) Diabetic Foot ◯

c) Kidney damage ◯

d) Option A & B ◯

e) Option A, B & C ◯

29. What are the different tests to be done to detect Diabetes?

a) HbA1c Test ◯ b) Fasting Blood Sugar Test ◯

c) Glucose Tolerance Test ◯ d) All of the above ◯

30. Which of the following is the best test for Diabetes?

a) HbA1c Test ◯ b) Fasting Blood Sugar Test ◯

c) Glucose Tolerance Test ◯ d) All of the above ◯

31. What is the normal range of blood glucose percentage in HbA1c Test?

a) <5.7% ◯ b) <6.5% ◯ c) <8.5% ◯ d) <7.5% ◯

32. Which of the following HbA1c value listed below indicate that person is diabetic?

a) ≥6.4% ◯ b) ≥6.5% ◯ c) ≥5.5% ◯ d) ≥7.0% ◯

33. What is the normal range of fasting blood sugar levels?

a) ≤80mg/dl ◯ b) ≤99mg/dl ◯ c) ≤125mg/dl ◯ d) 100-125mg/dl ◯

34. Which of the following fasting blood sugar level value listed below indicate that person is pre- diabetic?

a) 140-199mg/dl ◯ b) 90-100mg/dl ◯

c) 100-125mg/dl ◯ d) 120-135mg/dl ◯

35. Which of the following fasting blood sugar level value listed below indicate that person is diabetic?

a) ≥200mg/dl ◯ b) ≥126mg/dl ◯ c) ≥ 150mg/dl ◯ d) ≥140mg/dl ◯

36.Glycemic Index (GI) is _____?

a) a value used to measure how much food decrease blood sugar levels ◯

b) a value used to measure how much food increase blood sugar levels ◯

c) a value used to measure blood sugar after food ◯

III Part C- Heart Disease

37. Cardio means_____?

a) Veins ◯ b) Arteries ◯ c) Heart ◯ d) Kidney ◯

38. Building up fat and of cholesterol in blood vessels is known as _____

a) Fatty liver ◯ b) Cholesterolemia ◯ c) Plaque ◯ d) Plague ◯

39. Disease due to building up fat in blood vessel is called_____?

a) Abdomen obesity ◯ b) Fatty liver ◯ c) Atherosclerosis ◯

40. Coronary Arteries supply bloods to _____?

a) Lungs ◯ b) Brain ◯ c) Liver ◯ d) Heart ◯

41. Unable to pump blood by the heart is called _____?

a) Stroke ◯ b) Heart Attack ◯ c) Heart Failure ◯ d) Hypertension ◯

42. Nose bleeding is a symptom of Heart Attack?

a) Yes ◯ b) No ◯

43. Swelling (edema) is a symptom of Heart Failure?

a) Yes ◯ b) No ◯

44. When heart muscle doesn't get enough blood it is known as _____?

a) Stroke ◯ b) Heart Attack ◯

c) Heart Failure ◯ d) Haemorrhage ◯

45. Myocardial infarction is also known as _____?

a) Heart Failure ◯ b) Heart Attack ◯

c) Blood Clot ◯ d) Stroke ◯

46. Trouble in speaking is a symptom of_____?

a) Heart Failure ◯ b) Heart Attack ◯ c) Stroke ◯

47. Cold sweat, nausea, stiffness in upper body is symptoms of _____?

a) Stroke ◯ b) Heart Attack ◯ c) Heart Failure ◯

48. Stroke is related to brain?

a) Yes ◯ b) No ◯

49. Which of the following is a type of stroke?

a) Alzheimer ◯ b) Ischemia ◯ c) Parkinson ◯

50. Blue colouration of lips, hands & feet are symptoms of_____?

a) Stroke ◯ b) Heart Attack ◯ c) Asthma ◯

51. Stroke happens when blood vessel to brain is blocked?

a) Yes ◯ b) No ◯

52._____ occurs when the blood supply to part of the brain is interrupted?

a) Haemorrhage ◯ b) Ischemic stroke ◯ c) Atherosclerosis ◯

53. _____ occurs when there is bleeding in or around the brain?

a) Haemorrhage ◯ b) Ischemic stroke ◯ c) Atherosclerosis ◯

54. Which of the listed below is a heart disease?

a) Osteoporosis, Diabetic foot ◯ b) Stroke ◯

c) Urine infection ◯ d) Ulcerative colitis ◯

55. What is the symptom of heart attack?

a) Urinating Often ◯ b) Shortness of breath ◯

c) Slow healing of wounds ◯ d) Increased thirst ◯

56. Which of the following are unchangeable risk factors of heart disease?

a) High blood pressure ◯ b) Smoking ◯

c) Overweight ◯ d) Family History ◯

57. Which of the following are changeable risk factors of heart disease?

a) Age ◯ b) Sex ◯

c) High blood pressure ◯ d) Family History ◯

58. Is obesity a risk factor for heart attack?

a) Yes ◯ b) No ◯

59. Which of the following is used to diagnose heart Disease?

a) Mammography ◯ b) Sputum cytology ◯

c) Colonoscopy ◯ d) Electrocardiogram ◯

60. Which of the following are the treatments used for heart disease?

a) Surgery ◯ b) Chemotherapy ◯

c) Radiation therapy ◯ d) Balloon Angioplasty ◯

61. Is stress associated to heart attack?

a) Yes ◯ b) No ◯

62. Healthy weight is not a necessary factor for good heart?

a) Yes ◯ b) No ◯

63.Yellow & green GLV's (green leafy vegetables) contain_____?

a) High fiber ◯ Vitamin E ◯ c) Vitamin C ◯ d) Carotenoids ◯

64. Exercise helps to _____?

a) Lower LDL & incidence of obesity ◯

b) Lower HDL ◯

c) Helps to increase blood pressure ◯

65. What is hypertension?

a) Low blood pressure ◯ b) High stress ◯

c) High blood pressure ◯ d) Hyper active ◯

66. What is the normal range of blood pressure?

a) 120/80 mmHg ◯ b) 120/70 mmHg ◯

c) 110/85 mmHg ◯ d) 125/70 mmHg ◯

67. What is the range of Prehypertension?

a) 120-139/80-89 mmHg ◯ b) 111-120/70 -80mmHg ◯

c) 135-145/85-100 mmHg ◯ d) 139-145/70-99 mmHg ◯

68. What is the range of Stage 1 hypertension?

a) 121-139/81-89 mmHg ◯ b) 140-159/90 -99mmHg ◯

c) 150-159/95-99 mmHg ◯ d) 145-160/90-125 mmHg ◯

69. What is the range of Stage 2 hypertension?

a) ≥160 /≥100mmHg ◯ b) ≥150/≥90 mmHg ◯

c) ≥155/≥95 mmHg ◯ d) 145-160/90-125 mmHg ◯

70. Which of following is symptom of severs hypertension?

a) Nose bleeds ◯ b) Leg swelling ◯ c) Backache ◯ d) Rashes ◯

71. Which of the following is not a complication of hypertension?

a) Eye complication ◯ b) Heart disease ◯

c) Kidney disease ◯ d) Osteoporosis ◯

72. Is obesity a risk factor of hypertension?

a) Yes ◯ b) No ◯

IV Part- D Cancer

73. Which of the following is not a Cancer?

a) Lung ◯ b) Breast ◯ c) Colorectal ◯ d) Guillain-Barre syndrome ◯

74. Which of the following is used to diagnose Cancer?

a)Echocardiogram ◯ b) Exercise Stress test ◯

c) Biopsy ◯ d) Electrocardiogram ◯

75. Which of the following is non-modifiable risk factor of Cancer?

a) Smoking ◯ b) Obesity ◯ c) Age ◯ d) Physically active ◯

76. Which of the following is modifiable risk factor of Cancer?

a) Family History ◯ b) Unhealthy diet ◯ c) Age ◯ d) Sex ◯

77. Blood discharge is symptom of breast cancer?

a) Yes ◯ b) No ◯

78. Weight loss is a symptom of lung cancer?

a) Yes ◯ b) No ◯

79. Coughing up blood is a symptom of lung cancer?

a) Yes ◯ b) No ◯

80. Which of the following is a symptom of colorectal cancer?

a) Chest pain ◯ b) Infection in respiratory system ◯

c) Blood in stool ◯ d) Coughing up blood ◯

81. Which is not a diagnose for cancer_____?

a) Physical examination ◯ b) laboratory Test ◯

c) ECG ◯ d) Imaging Test ◯

82. Pain during swallowing is a symptom of _____?

a) Prostate cancer ◯ b) Breast cancer ◯ c) Mouth cancer ◯

83. Which of following is not a symptom of breast cancer_____?

a) Nipples Changes ◯ b) Lump in the breast ◯

c) Small breast ◯ d) Pitting of the breast skin ◯

84. Chest pain is a symptom of prostate cancer?

a) Yes ◯ b) No ◯

85. Frequent urination is a symptom of prostate cancer?

a) Yes ◯ b) No ◯

86. Which of the following is not a symptom of lung cancer_____?

a) Cough ◯ b) Shortness of breath ◯

c) Repeated respiratory infection ◯ d) Stomach pain ◯

87. Which of the following is not a symptom of colorectal cancer_____?

a) Diarrhea ◯ b) Persistent cough ◯

c) Abdominal pain ◯ d) Losing weight ◯

88. Which of the following is not a symptom of mouth cancer_____?

a) Shoulder or chest pain ◯ b) A lump in neck region ◯

c) Loosening of teeth ◯ d) Sores over cheek ◯

89. Which of the following is not a symptom of prostate cancer_____?

a) Decreased force of urination ◯ b) Slow healing of wound ◯

c) Urination hesitancy ◯ d) Urgent urination ◯

90. Raw vegetable should be avoided for cancer patient?

a) Yes ◯ b) No ◯

91. Which food is permissible for cancer_____?

a) Sugar sweetened foods ◯ b) Cooked vegetables ◯

c) Unpasteurized dairy product ◯ d) Processed food- meat, chips, etc. ◯

V Part-E Respiratory

92. Which of the following in not a chronic respiratory disease?

a) Ischemia ◯

b) Asthma ◯

c) COPD (Chronic Obstructive Pulmonary disease) ◯

93. Which of the following is a symptom of asthma _____?

a) Wheezing ◯ b) Dizziness ◯

c) Nose bleeding ◯ d) Off balance ◯

94. Back pain is a symptom of chronic respiratory disease?

a) Yes ◯ b) No ◯

95. Which of the following is a symptom of COPD _____?

a) Vision problem ◯ b) Facial drooping ◯

c) Stomach discomfort ◯ d) Respiratory infection ◯

96. Which of the following is a symptom of Asthma?

a) Urine infection ◯ b) Speaking problem ◯

c) Dry cough ◯ d) Vertigo ◯

97. Which of the following in not a symptom of chronic respiratory disease?

a) Chronic cough ◯ b) Wheezing ◯

c) Leg pain ◯ d) Chest tightness ◯

98.Which of the food items should be avoided for chronic respiratory disease?

a) Nuts & seeds ◯ b) milk & milk product ◯

c) Margarine ◯ d) Eggs ◯

VI Part F- Obesity

99. Which of the following range indicates obesity (According to Asia Pacific)?

a) ≥30 kg/m^2 ◯ b) ≥25 kg/m^2 ◯ c) 25-29.9 kg/m^2 ◯ d) ≥24 kg/m^2 ◯

100. Which of the following range indicates over weight (According to Asia Pacific)?

a) ≥30 kg/m^2 ◯ b) ≥25 kg/m^2 ◯ c) 23-24.9 kg/m^2 ◯ d) 24-25 kg/m^2 ◯

101. What is the Indicator to detect obesity?

a) Body Mass Index ◯ b) Waist Circumference ◯

c) Waist-Hip Ratio ◯ d) All of these ◯

102. Which is the best indicator to detect central obesity?

a) Body Mass Index ◯ b) Waist Circumference ◯ c) Waist-Hip Ratio ◯

103. What is the cut-off of waist circumference for Male?

a) 90cm ◯ b) 85cm ◯ c) 80cm ◯ d) 95cm ◯

104. What is the cut-off of waist circumference for Female?

a) 90cm ◯ b) 85cm ◯ c) 80cm ◯ d) 95cm ◯

105. Which of the following is not risk factor of obesity?

a) Diabetes ◯ b) Pneumonia ◯ c) Hypertension ◯ d) Heart Disease ◯

106. Is age a cause of obesity?

a) Yes ◯ b) No ◯

107. Is obesity a risk factor of cancer?

a) Yes ◯ b) No ◯

108. How do you manage Obesity?

a) Healthy Diet ◯ b) Physical Activity ◯ c) Both a & b ◯

109. Is Arthritis risk factors of obesity?

a) Yes ◯ b) No ◯

110. Is low blood pressure risk factors of obesity?

a) Yes ◯ b) No ◯

VII Part G- Physical Activity

111. Which of following is not a sedentary life style?

a) Physically active ◯ b) Sitting whole day ◯

c) Physically inactive ◯ d) Sleeping and laying ◯

112. Does physical activity help to lower the blood pressure?

a) Yes ◯ b) No ◯

113. Physical activity does not help to lower the risk of blood sugar level?

a) Yes ◯ b) No ◯

114. Which of these activities are aerobic exercises?

a) Squats ◯ b) Push-up ◯ c) Jogging ◯ d) All of these ◯

115. Which of these activities are muscle strengthening exercises?

a) Bicycling ◯ b) Squats ◯ c) Walking ◯ d) All of these ◯

116.Which of the following is a vigorous activity?

a) Slow Walking ◯ b) Yoga ◯

c) Walking fast ◯ d) Slow bicycling ◯

117. Which of the following is moderate activity?

a) Running slow ◯ b) Running fast ◯

c) Walking fast ◯ d) Push-up ◯

118. According to WHO how many minutes of vigorous intensity exercises should be done per week?

a) 75-150min. ◯ b) 70-120min.◯ c) 100min.◯ d) 30min. ◯

119. How many levels of physical activity?

a) 3 ◯ b) 5 ◯ c) 7 ◯ d) 9 ◯

120. Reading, sitting, typing and taking pet out- these activities belong to_____ level.

a) Low level ◯ b) Average ◯ c) High ◯

121. Skipping, running & weight lifting- these activities belong to _____level.

a) Low level ◯ b) Average ◯ c) High ◯

122. According to WHO how many minutes of moderate-intensity exercise should be done per week?

◯

a) 120min. ◯ b) 100min. ◯ c) 150-300min. ◯ d) 30min.

123.Physical activity reduces risk of certain cancers?

a) True ◯ b) False ◯

124. Physical activity has no effect on bone health?

a) True ◯ b) False ◯

125. Physical activity has no effect on diabetes?

a) True ◯ b) False ◯

126. How many minutes of exercise should be done daily?

a) 60 min. ◯ b) 30 min. ◯ c)120 min. ◯

127.Dementia can be reduce by physical activity?

a) True ◯ b) False ◯

128.Blood pressure can be decreased by physical activity?

a) True ◯ b) False ◯

129. Aerobic activity means _____?

a) Swallowing air ◯ b) Using oxygen ◯

c) Using carbon dioxide ◯ d) Breathing out air ◯

130. Why is muscular fitness very important?

a) For the growth of muscles ◯

b) To prevent injury & improve body composition ◯

c) To lower the bone density ◯

131. Which of the following yoga asana helps to reduce high blood pressure?

a) Bhujangasana ◯ b) Tadasana ◯

c) Trikonasana ◯ d) Pranayama ◯

132. Which of the following yoga asana helps to reduce the side effect of diabetes is damaging kidneys?

a) Bhujangasana ◯ b) Ardha-halasana ◯

c) Trikonasana ◯ d) Pranayama ◯

VIII Part H- Healthy Diet

133.Healthy eating means_____?

a) eating till stomach is full ◯

b) eating carbohydrates & fats to maintain proper weight ◯

c) eating nutritious foods ◯

d) eating full meals three times a day ◯

134. What are the different food groups based on their function in the body?

a) Immunity foods, bone building foods ◯

b) Energy giving, body building foods, protective foods ◯

c) Blood building Foods ◯

135. Are you aware of balanced diet?

a) Yes ◯ b) No ◯

136. A balanced diet is: _____?

a) a diet which has addition of key vitamins and minerals such as iron, iodine, zinc, vitamin A & vitamin D to improve nutritional content. ◯

b) a diet which provides all the nutrients in required amount on daily basis. ◯

c) a diet which has fat, protein and vitamin in equal amount. ◯

d) a diet consisting of sweet, sour, and bitter food groups. ◯

137. Are you aware of food pyramid concept?

a) Yes ◯ b) No ◯

138. A food pyramid is_____?

a) a visual representation of how different foods and drinks contribute towards a healthy balanced diet. ◯

b) a pyramid with food groups at the top and bottom ◯

c) a pyramid which provides all the nutrients in required amount on daily basis. ◯

d) a pyramid representing proportion of food groups for meeting 2000kcal ◯

139.Are you aware of My Plate (NIN- National Institute of Nutrition concept)?

a) Yes ◯ b) No ◯

140.My Plate is _____?

a) a diet which has addition of key vitamins and minerals to improve nutritional content. ◯

b) a diet representing proportion of different food groups for meeting 2000kcal ◯

c) a diet which has fats, proteins and vitamins in equal amount ◯

d) a diet which provides all the nutrients in required amount on daily basis. ◯

141.What is the full form of DASH diet _____?

a) Dietary Approach to Stop Obesity ◯

b) Dietary Approach to Stop High Fat intake ◯

c) Dietary Approach to Stop High salt intake ◯

d) Dietary Approach to Stop Hypertension ◯

142.What is DASH diet?

a) Reduce sodium intake ◯

b) Encourage intake of whole grains, fruits and vegetable ◯

c) Encourages low- fat dairy product ◯

d) Dietary Approach to Stop Hypertension ◯

e) All of the above ◯

143. According to WHO, how much of fruits & vegetables should be eaten per day _____?

a) 500g (i.e. five portions) ◯ b) 200g (i.e. three portions) ◯

c) 400g (i.e. five portions) ◯ d) 300g (i.e. four portions) ◯

144.According to My Plate, how much amount of fruits should be eaten per day?

a) 200 gm ◯ b) 100 gm ◯ c) 150gm ◯ d) 250gm ◯

145. According to My Plate, how much amount of vegetable should be eaten per day?

◯ ◯ ◯ ◯

a) 400gm b) 200gm c) 500gm d) 350gm

146.A healthy diet should include?

a) Unsaturated fat ◯ b) Saturated fat ◯

147. Trans fat is good for health?

a) Yes ◯ b) No ◯

148.Trans fat is found in_____

a) Samosa, bakery items ◯ b) Nuts, flaxseeds ◯

c) Fruits & vegetables ◯ d) Corn oil, olive oil & canola oil ◯

149. Limit the salt intake to?

a) <5gm(less than 1 tsp.) ◯ b) <2gm (½ tsp.) ◯

c) <10gm (less than 2 tsp.) ◯ d) <2.5gm(less than ¾ tsp.) ◯

150. How much amount of fat/oil, intake is recommended daily?

a) <15g ◯ b) 15-20g ◯ c) 20-25g ◯ d) 25-30g ◯

151. How much amount of sugar, intake is recommended daily?

a) 15g ◯ b) 20g ◯ c) 25g ◯ d) 30g ◯

152. Samosa, bhajiya is an item of_____?

a) Unsaturated fat ◯ b) Trans fat ◯

153. Is common salt is better than iodized salt?

a) Yes ◯ b) No ◯

154. Fortified foods are not good for health?

a) Yes ◯ b) No ◯

155. Is skimmed milk better than whole milk for NCD patients ?

a) Yes ◯ b) No ◯

156. Meat, Fish & Egg is a source of protein giving foods?

a) Yes ◯ b) No ◯

157. Fortified foods help to improve_____?

a) Macronutrients deficiencies ◯

b) Micronutrients deficiencies ◯

c) Both A & B ◯

158. Fortified oils have which vitamins_____?

a) Vitamin A & D ◯

b) Vitamin K & D ◯

c) Vitamin A & K ◯

159. Is vegetable an item of fortified food?

a) Yes ◯ b) No ◯

160. Which type of food source is egg _____?

a) Protein ◯ b) Fiber ◯ c) Energy ◯

161. Which of the following is fiber rich food?

a) Milk ◯ b) Fruits ◯ c) Fish ◯

162.Is wheat flour fortified food item?

a) Yes ◯ b) No ◯

163. What is wheat flour fortified with _____?

a) Iodine, magnesium, potassium

b) Iron, folic acid, vitamin B12

c) Selenium, phosphorus, sodium

164. How many glasses of water should be taken daily?

a) 3-7 glasses ◯ b) 8-10 glasses ◯

c) 1-5 glasses ◯ d) 2-3 glasses ◯

165. Which is healthier?

a) red meat ◯ b) lean meat ◯

166.Which is a healthier option_____?

a) Using one type of vegetable oil for cooking ◯

b) Using a different types of vegetable oil for cooking ◯

167. Tick the healthier food item

a) Dhokla ◯

b) Khari ◯

c) Puff ◯

168.Which is better?

a) Orange juice ◯ b) Orange ◯

169. Why should you avoid fried foods?

a) High in saturated fatty acid ◯ b) Bad in taste ◯

c) Cannot be preserved for long time ◯ d) Difficult to cook ◯

170.Why are sprouts a healthier options?

a) High in fat ◯

b) Great source of vitamins, minerals, fiber & antioxidants ◯

c) High in cholesterol ◯

d) Good source of B12 ◯

171. Eating fruits daily is compulsory?

a) Yes ◯ b) No ◯

172.Daily consumption of salad is good for health because _____?

a) it is a good source of vitamins, minerals & fiber ◯

b) it is a good source of free fatty acid ◯

c) it is a good source of sugar ◯

d) All of the above ◯

173. What is in bran that is good for health _____?

a) for preventing high cholesterol & diabetes ◯

b) for weight gain ◯

c) for preventing edema ◯

d) for preventing gas ◯

174. What is good about millets_____?

a) good source of fiber ◯ b) good source of vitamin D ◯

c) good source of sodium ◯ d) good source of polyphenols ◯

175. Do you think diet plays an important role in preventing NCDs?

a) Yes ◯ b) No ◯

176. Which of the following helps for NCD prevention?

a) Sedentary lifestyle ◯

b) Sleeping for 10hrs. ◯

c) Increase physical activity ◯

d) Taking lift instead of stair case ◯

177. The tagline "Aaj se thoda kam" in the media emphasizes on reducing_____?

a) Fat, Sugar, salt ◯

b) Protein, minerals ◯

c) Carbohydrates, vitamins ◯

d) Water and juices ◯

178. Whole grain, oats products contain_____?

a) Vitamin E ◯ b) Vitamin C ◯ c) Carotenoids ◯ d) High fiber ◯

179. Dark GLV's, nuts, whole grain & vegetable oil contains_____?

a) Carotenoids ◯ b) Vitamin E ◯ c) Vitamin C ◯ d) High fiber ◯

180. Polyphenols are found in _____?

a) Flax seeds ◯ b) Amla ◯ c) Soya ◯ d) Green Tea ◯

181.For a diabetic what are the precautions_____?

a)reduce sugar & carbohydrate intake ◯

b) maintain proper weight ◯

c) walking / jogging/running ◯

d) all of the above ◯

182. For hypertensive patient what are the precautions_____?

a) exercise daily ◯

b) reduce salt ◯

c) reducing fat's/fatty foods ◯

d) all of the above ◯

183.To reduce overweight/obesity_____?

a) Eat minimum food ◯

b) daily exercise & healthy diet ◯

c) drink less water ◯

d) sleep more than 10 hrs. ◯

APPENDIX VIII
Practice, Attitude Questionnaire

DEPARTMENT OF FOODS AND NUTRITION

FACULTY OF FAMILY & COMMUNITY SCIENCES

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

VADODARA 390 002- INDIA

Intervention to Control NCDs & NCD Risk Factors among the University Employees 2022-23:–

Dr. Sonal Mishra, Prof. Annie Kuruvilla & Reema Patel

1. Do you consume Alcohol such as beer, wine or any other?

a) Yes ◯ b) No ◯

2. What is the frequency of alcohol consumption?

a) Daily ◯

b) Weekly

c) Occasionally ◯

d) Never ◯

3. Do you chew tobacco/smoke?

a) Yes ◯ b) No ◯

4. What is your fruit consumption in a day?(note: 1medium banana=101gm, 1 small apple=149 gm., 1katori papaya=145gm, 1small orange=96gm, 1katori Pomegranate=174)

a) Less than 150 gm. b) More than 150 gm.

5. What is your vegetables (excluding potato) consumption in a day? (1 katori lady finger (bhindi) =100gm,1 katori cabbage(gobi)=100gm, 1 katori cauliflower(fulavar)=100,1 katori carrot=100gm, 1 katori tomato=180gm, 1 katori tindora=100g) ◯ ◯

a) Less than 250 gm. b) More than 250 gm.

6. What is the frequency of fruit consumption? (Example: 1 medium banana, 1 small apple, 1large papaya, 1 orange, etc.)

a) Daily ◯

b) Weekly ◯

c) Occasionally ◯

d) Never ◯

7. What is the frequency of eating meal outside ?

a) Daily ◯

b) Weekly ◯

c) Occasionally ◯

d) Never ◯

8. What is the frequency of consumption of bajra, sorghum,jawar,maize (coarse grains)?

a) Daily ◯

b) Weekly ◯

c) Occasionally ◯

d) Never ◯

9. Do you take breakfast?

a) Yes ◯ b) No ◯

10. Do you take lunch?

a) Yes ◯ b) No ◯

11. Snack at office?

a) Yes ◯ b) No ◯

12. How often do you add salt to your food right before you eat it or while you are eating it?

a) Always ◯

b) Sometimes ◯

c) Never ◯

13.How often do you eat ultra- processed food ? (Example: namkeen, packaged chips, sauces, ice-cream, French fries, soda, chicken nuggets, breakfast cereal , cake & cookie, khari & khakhra etc.)

a) Daily ◯

b) 1-2 times per week ◯

c) Never ◯

14.How often do you eat preserved/ canned salty products? (example: pickles, papad, jams, frozen green peas,etc.)

a) Daily ◯

b) 1-2 times per week ◯

c) Never ◯

15.How often do you take homemade high salt containing food like chutney, pickle, chunda, etc.?

a) Daily ◯

b) 1-2 times per week ◯

c) Never ◯

16.How often do you take other dairy products having high salt like, processed/packaged cheese, butter, etc. (these are different from homemade butter and cheese)

a) Daily ◯

b) 1-2 times per week ◯

c) Never ◯

17. How often do you eat fried foods like bhajiya, samosa, gota and bread pakoda?

a) Daily ◯

b) 1-2 times per week ◯

c) Never ◯

18. What is the frequency of consumption of maida (bread, khari, etc.)?

a) Daily ◯

b) Weekly ◯

c) Occasionally ◯

d) Never ◯

19. Daily do you walk for 10minutes or use a bicycle for at least 10 minutes continuously to get to and from places?

a) Yes ◯ b) No ◯

20. In a week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?

a) Daily ◯

b) Once a week ◯

c) Twice a week ◯

d) Thrice or more than thrice a week ◯

e) Never ◯

21. In a week, if you walk or bicycle, how much time do you spend walking or bicycling (write hours/minutes)?

ANS:

22. Do you do any vigorous-intensity sports, fitness or a recreational (leisure) activity that causes large increase in breathing or heart rate like [running /badminton/football] for at least 10 minutes continuously?

a) Yes ◯ b) No ◯

23. If yes, in a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?

a) Daily ◯

b) Once a week ◯

c) Twice a week ◯

d) Thrice or more than thrice a week ◯

e) Never ◯

24. On a typical day that you do vigorous – intensity sports, fitness or recreational (leisure) activities how much time do you spend on these activities (write hours/minutes)?

ANS:

25. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, and volleyball] for at least 10 minutes continuously?

a) Yes ◯ b) No ◯

26. If yes, in a typical week, how many days do you do moderate-intensity sports, fitness or recreational activities?

a) Daily ◯

b) Once a week ◯

c) Twice a week ◯

d) Thrice or more than thrice a week ◯

e) Never ◯

27. On a typical day that you do moderate intensity sports, fitness or recreational activities how much time do you spend on this activities (write hours/minutes)?

ANS:

28.How many hours do you sleep at night?

a) 8hrs. or more ◯ b) 6-7 hrs. ◯ c) less than 6 hrs. ◯

29. Do you sleep daily in the afternoon?

a) Yes ◯ b) No ◯

30.If yes, than how many hours do you sleep?

a) less than 1hrs. ◯ b) 1-2hrs. ◯ c) more than 2hrs. ◯

31. Do you do any kind of exercise (yoga, walking or any other) early morning?

a) Yes ◯ b) NO ◯

32. Do you do any kind of exercise (yoga, walking or any other) in evening?

a) Yes ◯ b) NO ◯

33. After dinner (at night) what do you do?

a) Go for walk ◯

b) Sit and watch TV ◯

c) Go directly to sleep ◯

34. How long do you sit continuously in the chair in office?

a) Less than 2 hours ◯

b) 2-4 hours ◯

c) More than 5hrs. ◯

35. How much time do you spend watching television?

a) 1-4 hours a day ◯

b) More than 4 hours a day ◯

c) Occasionally ◯

d) Never ◯

36. How much time do you spend working on computer?

a) Less than 4 hours a day ◯

b) 4 hours a day or above ◯

c) Never ◯

37. How much time do you spend playing games in mobile / tablet?

a) Less than 3 hours a day ◯

b) 3 hours a day or above ◯

c) Never ◯

38. How much time do you spend talking with friends or doing other sitting activities like writing and reading newspaper etc.?

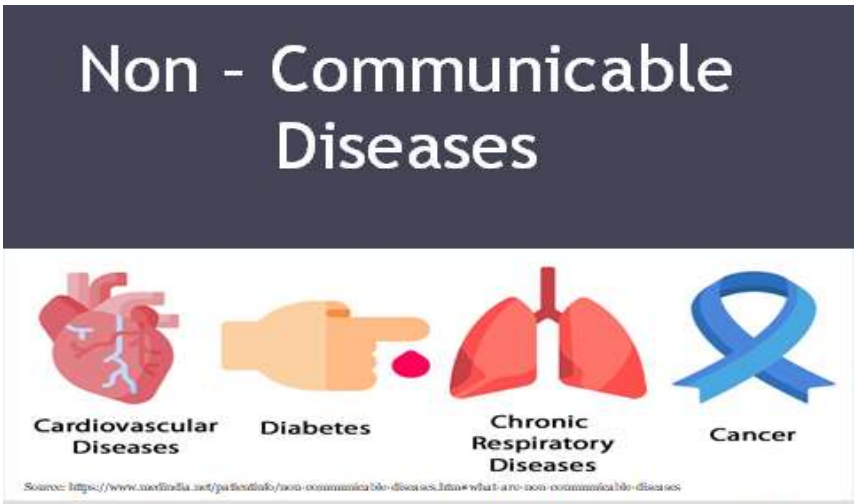
a) Less than 2 hours a day ◯

b) 2 hours a day or above ◯

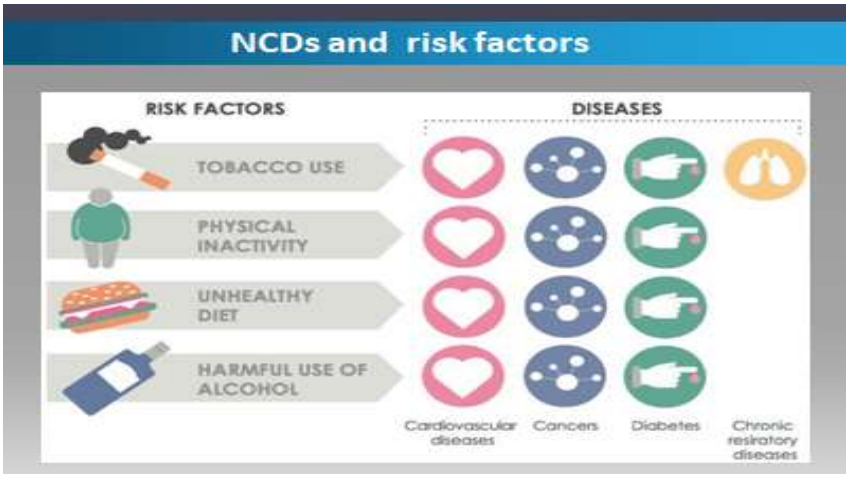
c) Never ◯

APPENDIX IX

Power Point Presentations used in Counseling



Title: Intervention to Control NCDs & NCD Risk Factors among the UniversityEmployees :–



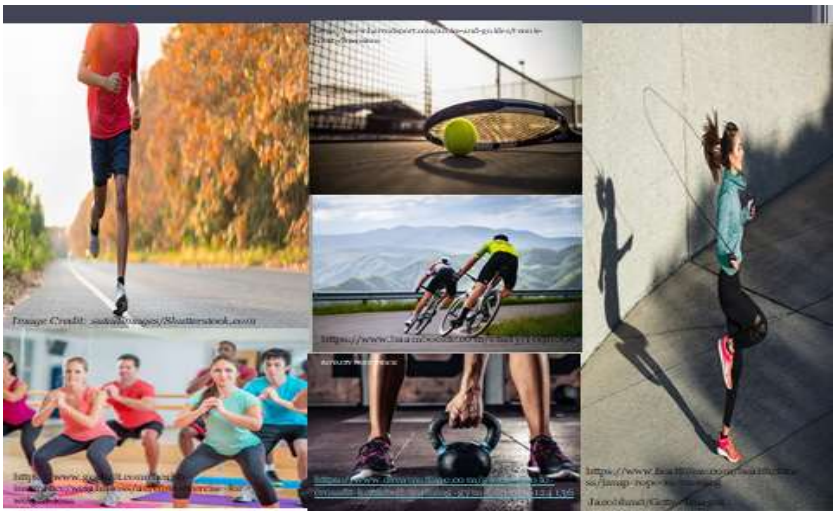
Non- Modifiable Risk Factors

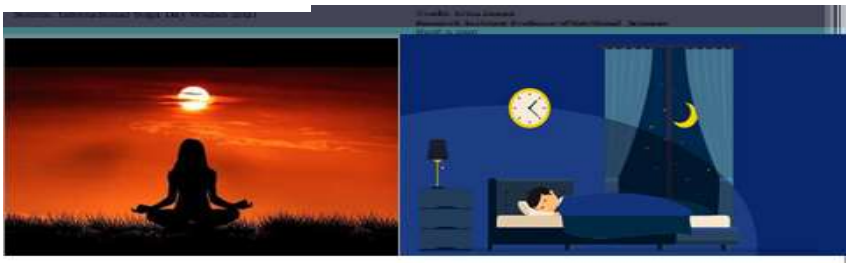
- Family History
- Ethnicity
- Age

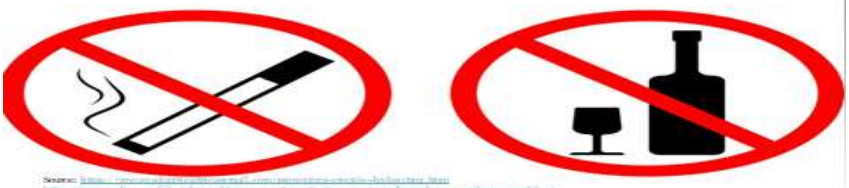
Source: https://www.quora.com/Why-do-we-grow-old-and-die
https://elitecjaer.com/wp-content/uploads/2020/11/Family-Health-History-1200x628.jpg

Non-communicable Diseases - Prevention and Cure

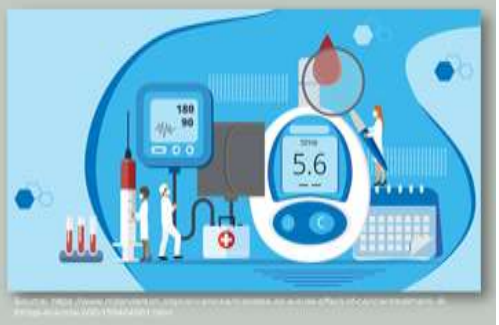
Healthy Diet







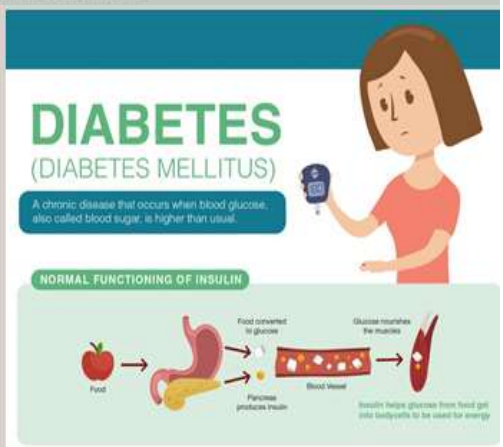
Guide to control Diabetes



Title: Intervention to Control NCDs & NCD Risk Factors among the University Employees :-
Dr. Sonal Mishra, Prof. Annie Kuruvilla & Reema Patel

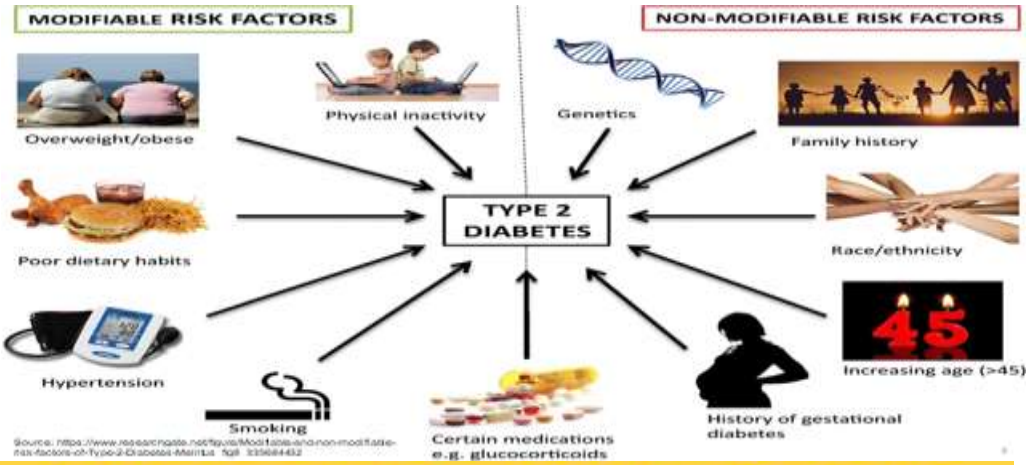
01 Introduction

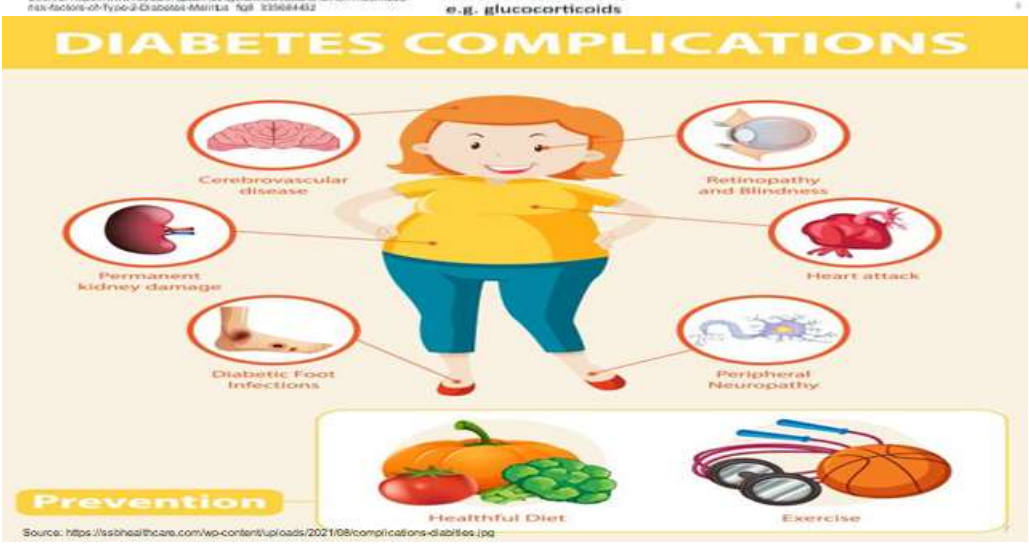
Diabetes mellitus (DM), is a group of metabolic diseases in which there are high blood sugar levels in the body over a prolonged period.



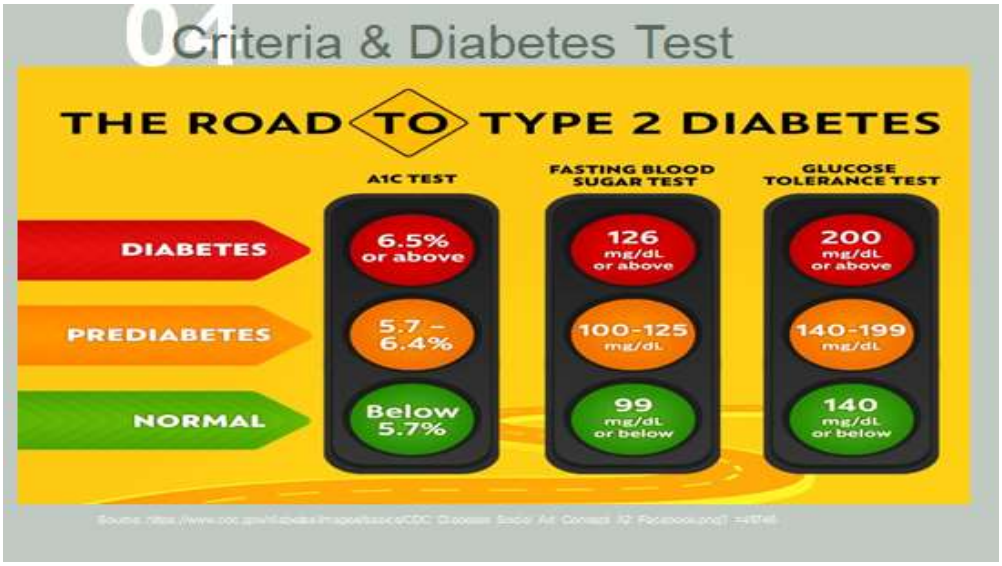
02 Symptoms

- Frequent urination, resulting in dehydration and extreme thirst.
- Dry mouth and itchy skin.
- Weight loss
- Nerve damage- leading to retinopathy(eye), nephropathy(kidney) & neuropathy(tingling in hands & legs)which makes healing difficult.
- Yeast infections may occur in men and women who have diabetes as a result of yeast feeding on glucose.





Source: https://ssbhealthcare.com/wp-content/uploads/2021/08/complications-diabities.jpg



Diabetes Tests

➢HbA1C Test

The HbA1C test measures the average blood sugar levels over the past 2 or 3 months. (best test for Diabetes)

➢Fasting Blood Sugar Test

This measures the blood sugar levels after an overnight fast (not eating). For fasting blood sugar test there should be gap of 10-12hours after having food.

➢Glucose Tolerance Test

This measures the blood sugar level before and after a liquid drink that contains glucose.Fast (not eat) overnight before the test and have the blood drawn to determine the fasting blood sugar level.

Glycemic Index

The glycemic index (GI) is a value used to measure how much specific foods increase blood sugar levels.

- Foods are classified as low, medium or high glycemic foods and ranked on scale of 0-100.

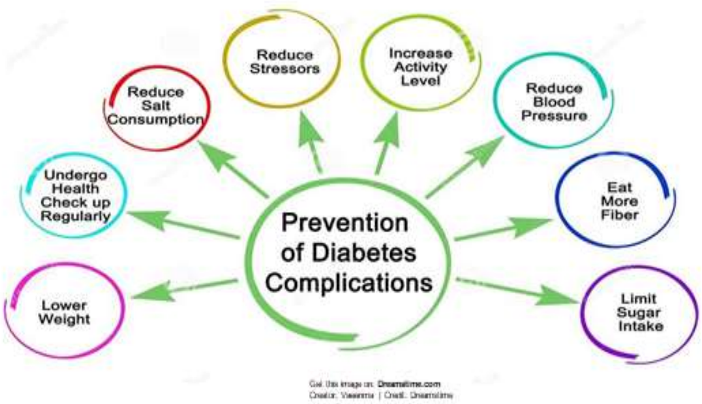
Low GI- 0-55
Medium GI- 55-69
High GI-70-100

- The lower the GI of a specific food, the less it may affect your blood sugar levels.
- Foods in protein, fat or fiber typically have a low GI.
- Foods that contain no carbs are not assigned a GI and include meat, fish, poultry, nuts, seeds, herbs, spices and oils.

High GI: ≥70	Medium GI: 56-69	Low GI:≤55
Glucose(103), Water melon(76), Potato boiled(78), Cornflakes (81), Instant oats porridge(79), Dosai with podi(91.3), Idli with chutney(101.5),Rava upma/dhokla, Hanadvo(90.), Muthiya(70), White wheat bread(75), Whole wheat bread(74), Puffed rice, White rice boiled(73),Rasam rice with papad (77.5), Gujarati meal(83), Sambhar rice(83.), Bengali meal(70),.	Sucrose(65), Honey(61), Fig(61),Pineapple(59), Mango juice(58), Banana ripe(62), Potato( ), Sweet potato boiled(63), Wheat flakes biscuit(69), Muesli(57), Rice flakes, Uttapam(64), Methi thepla(60), Uttapam with chutney(63), Adai with chutney(69.6),.Vegetable cutlet(62) Semolina(Rava)(66),Popcorn (65), Soft drink/soda(59), Cheese pizza(60), Marconi& cheese(64), , South Indian meal(83.3), Curd rice with curry leaves chutney(65.4), Punjabi meal(68) Biselle Bhat(58), Wheat roti(62), Brown rice boiled(68).	Fructose(15), Cashew nut(20), Walnut(15), Apple(36), Orange(43), Banana raw(51), Mango raw (51), Dates raw(42), Peaches(43), Strawberry(49), Apple juice(41), Orange juice(50), Plum(40), Coconut(42), Grapes(53), Kiwi(38), Pear(37), Guava(24), Custard apple(54), Carrot boiled(39), Vegetable soup(48), Capsicum(15), Tomato (15), Onion(10), Green peas(48), Spinach(15), peas(38),Cauliflower(30), Cabbage(10), Green beans(32),Mushroom(15), Broccoli(15), Cucumber(15), Lettuce(15), Chillies(15), Sweetcorn(52), Kidney beans(Rajmah)(24),Lentils(32), Chickpeas(28), Soya beans(16),Green moong dal(38),Black eyed Bajara, Barley(28), ,Bengal gram dal(28), Milk, full fat(39), Milk skim(37), Soya milk (34), Porridge-rolled oats(55), Besan Chilla(43.65) Rice noodles(53), Kodari(54), Yogurt fruit(41), Pasta(50) Multi grain bread(53),Chapatti(52), Corn tortilla(46), Spaghetti, white(49), Spaghetti, whole meal(48), Pongal with sambhar(53.6) .

How to self Monitor

- Wash your hands with soapy water and dry them well.
- Insert the test strip into the glucose meter.
- Insert the lancet into the lancing device.
- Prick the end of a finger (on the side).
- Gently squeeze the end of your finger, if necessary.
- Apply the blood to the test strip.



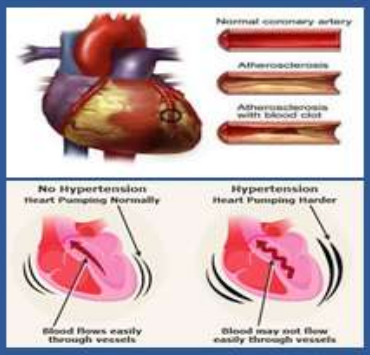
HEART DISEASE

Introduction

- Heart disease /cardiovascular disease is a class of diseases that affects the heart and blood vessel many of which are related to a process called atherosclerosis.
- Cardio –relates to the heart
- Vascular –relates to the veins and arteries

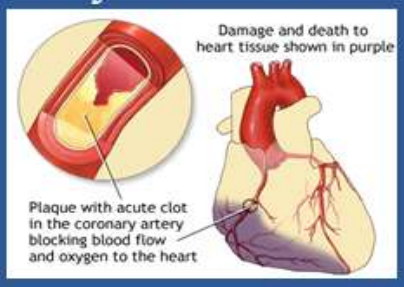
Causes

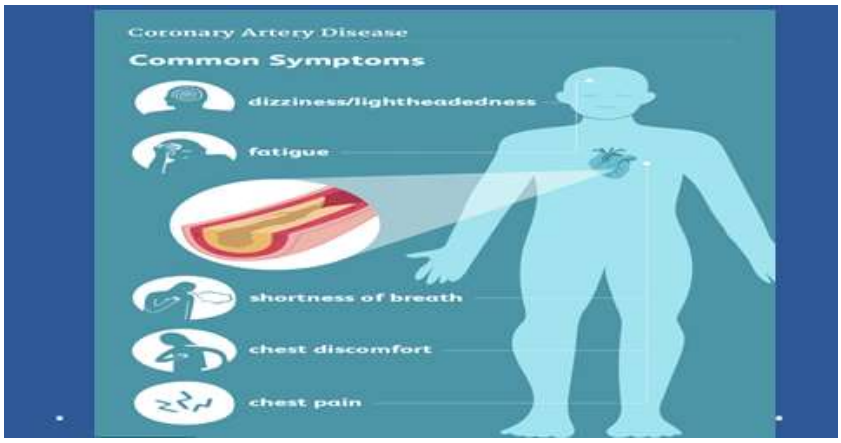
- Atherosclerosis- the buildup of fats, cholesterol and other substances in and on the artery walls
- Hypertension- when blood pressure is too high. A condition in which the force of the blood against the artery walls is too high.



Coronary Artery Disease

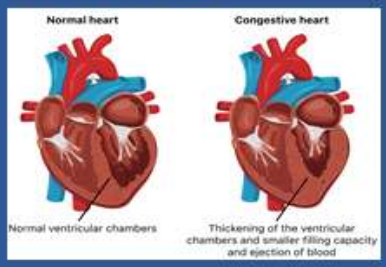
Coronary artery disease (CAD) is a condition that affects coronary arteries, which supply blood to heart, buildup of plaque narrows or blocks one or more of the coronary arteries.

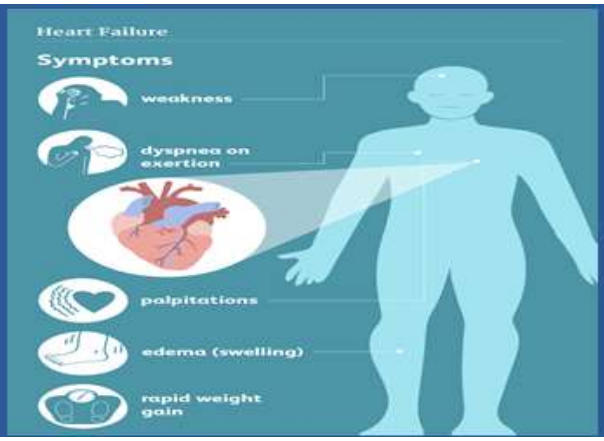




Heart failure

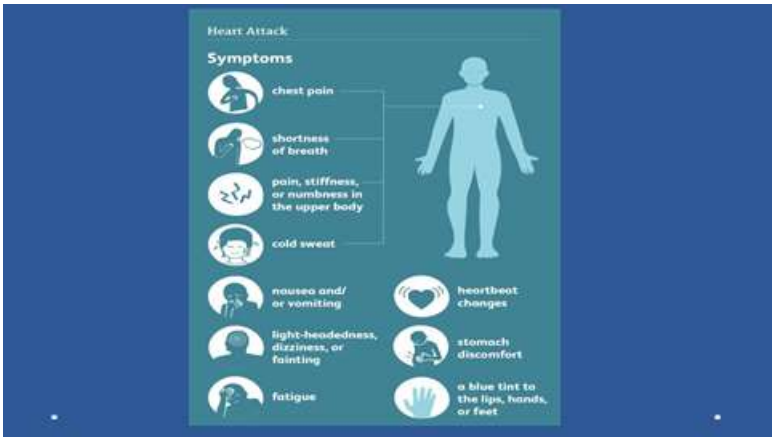
- Heart failure means that the heart is unable to pump blood around the body properly. It usually happens because the heart has become too weak or stiff.





Heart Attack

- A heart attack, also known as myocardial infarction, happens when a part of the heart muscle doesn't get enough blood.



Stroke

- Stroke is a disease that affects the arteries leading to and within the brain.
- A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts (or ruptures).

Ischemic Stroke

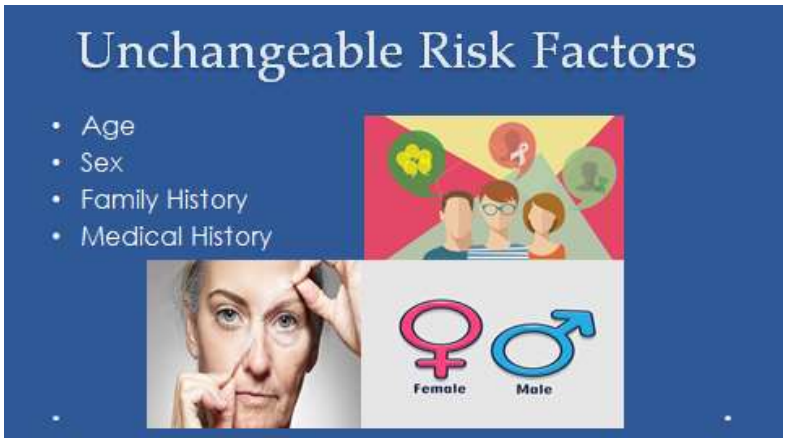
the surface of the brain leaks or breaks open, causing bleeding in or around the brain. This leads to swelling and pressure, which can

in the brain.

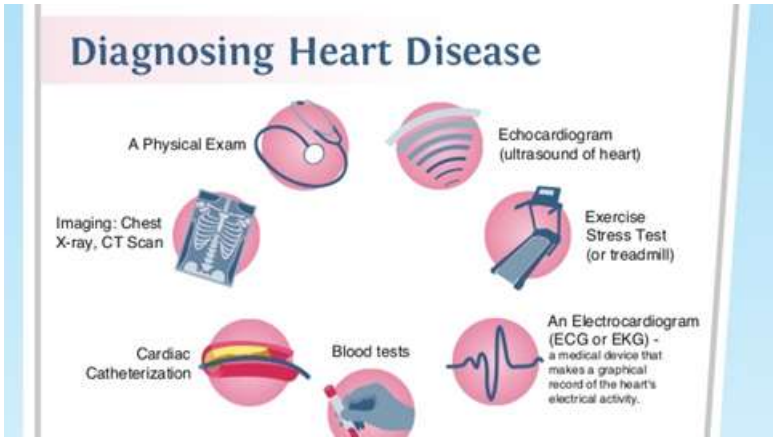
Hemorrhagic Stroke

Hemorrhage/blood leaks into brain tissue


Symptoms
1
Facial drooping
2
Body weakness
3
Off balance
4
Trouble speaking
5
Vision problems

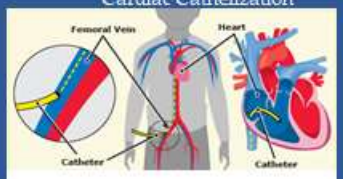

Unchangeable Risk Factors
Age
Sex
Family History
Medical History
Female
Male


Changeable Risk Factors
DIABETES
HIGH BLOOD PRESSURE
OVERWEIGHT
RISK FACTORS FOR
HEART DISEASE
HIGH CHOLESTEROL
HDL
LDL
PHYSICAL INACTIVITY
SMOKING


Diagnosing Heart Disease
A Physical Exam
Echocardiogram (ultrasound of heart)
Imaging: Chest X-ray, CT Scan
Exercise Stress Test (or treadmill)
Cardiac Catheterization
Blood tests
An Electrocardiogram (ECG or EKG) - a medical device that makes a graphical record of the heart's electrical activity.

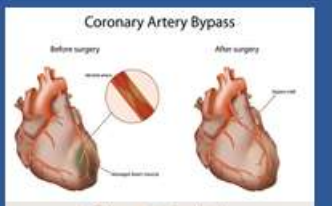
Treatments

Cardiac Catherization

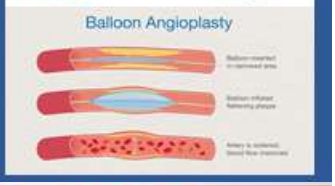


Stenting

Coronary Artery Bypass



Balloon Angioplasty



HOW TO PREVENT HEART ATTACKS

Foods which are beneficial

Vit. E

- Sources- veg. oil, dark GLVs, nuts & whole grain

Carotenoids

- Sources- GLVs & yellow –orange coloured vegetables

High Fiber

- Sources- whole grain, oats products, millets
- Reduces serum cholesterol & blood pressure

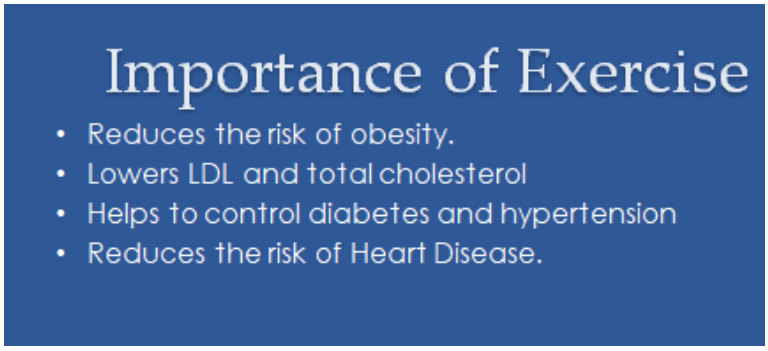
Fenugreek Seeds

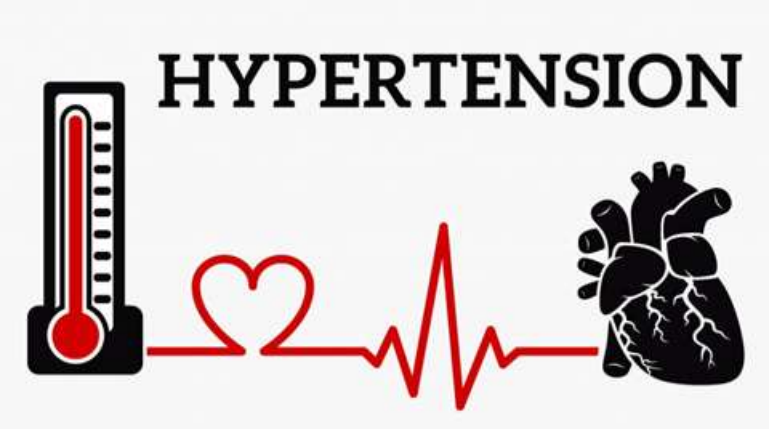
Yoghurt & Milk

Soy Protein

Sources- soya milk, tofu, soya nuggets

Food Allowed	Food Excluded
Cereal: Brown rice, whole wheat, oats, jowar, bajra, ragi Pulses: red gram, green gram, black gram, bengal gram and beans	Avoid refined foods and their products like maida, white bread.
All types of Vegetables. Roots and tuber in moderations.	Avoid caffeine and alcohol
Fruits: banana, citrus fruits-orange, mousambi, grape fruit, grapes, lemon; berries-strawberry, blueberry, black berry; cranberry, cherries, papaya, pineapple, avocado, guava etc.	Avoid frozen and processed foods
Milk and milk products: low fat milk, low fat curd, low fat paneer	Avoid red meat, oily and fat foods





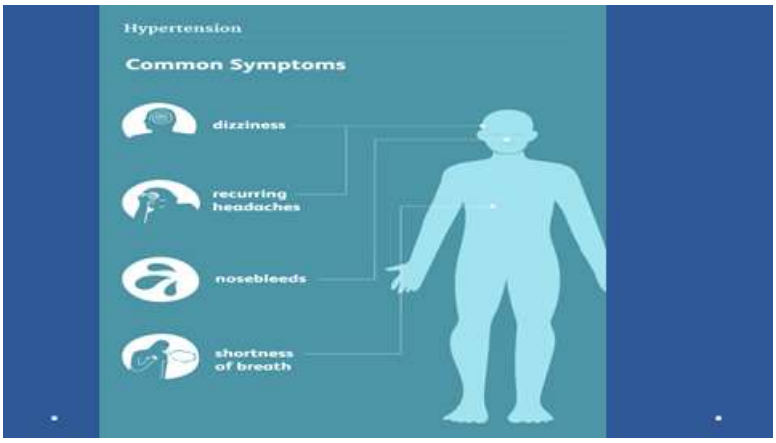
Blood Pressure Levels

Category	Systolic (mmHg)	Diastolic (mmHg)
Normal	Less than120	Less than 80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥160	≥100

Risk Factor

Sedentary lifestyle | Obesity | Diabetes Mellitus

High salt intake | Stress | Family History



Complications

- Eye Complication
- Heart disease
- Kidney disease
- Stroke

High blood pressure: you can prevent it.

World Health Organization

- Reduce salt to less than 5g daily
- Eat fruits and vegetables regularly
- Avoid saturated fats and trans fats
- Avoid tobacco
- Reduce alcohol
- Be physically active every day

Skimmed Milk

Flax seeds

Whole grains

Foods to Eat

Fruits & Vegetables

Coconut water

Herbs

Foods to Avoid

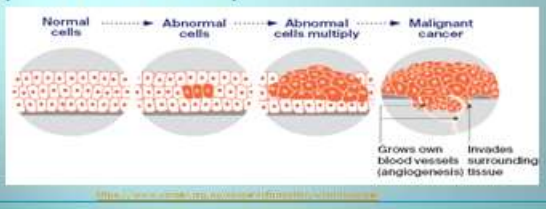
- Deep fried food
- Canned products
- Salted snacks – potato chips, pickles, papads
- Sauces
- Saturated fat- Khari, puff, samosa, nankhatai

Cancer

Title: Intervention to Control NCDs & NCD Risk Factors among the University Employees :-
Dr. Sonal Mishra, Prof. Annie Kuruvilla & Reema Patel

What is Cancer?

- Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body.



Diagnosis

Physical exam:

Laboratory tests

Imaging tests

Biopsy

Common Type of Cancer

- Breast cancer
- Lungs cancer
- Colorectal cancer
- Prostate cancer
- Mouth cancer

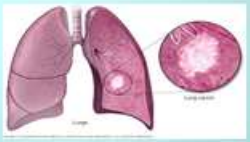
Breast cancer

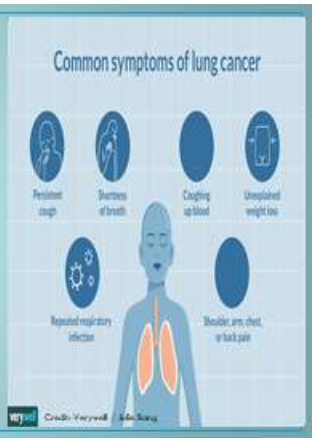
- Breast cancer is cancerous tumor that starts in the cell of the breast. It is found in women, but men can get breast cancer, too.

Source:

Lung cancer

- **Lung cancer begins in the lungs and may spread to lymph nodes or other organs in the body, such as the brain.**





Colorectal cancer

- Cancer that begins in the colon is called a colon cancer, while cancer in the rectum is known as a rectal cancer. Cancers that affect either of these organs may be called colorectal cancer.

https://www.freepik.com/free-photos-vectors/colon-cancer

SYMPTOMS:

- A change in bowel habits.
- Blood in or on your stool (bowel movement).
- Diarrhea, constipation, or feeling that the bowel does not empty all the way.
- Abdominal pain, aches, or cramps that don't go away.
- Losing weight.

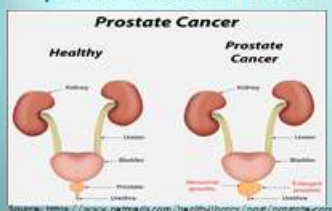
Mouth cancer

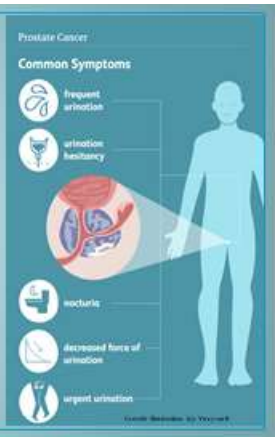
- Mouth cancer refers to cancer that develops in any of the parts that make up the mouth (oral cavity). Mouth cancer can occur on the:
- Lips
- Gums
- Tongue
- Inner lining of the cheeks
- Roof of the mouth
- Floor of the mouth (under the tongue)
- Cancer that occurs on the inside of the mouth is sometimes called oral cancer or oral cavity cancer.

https://cytecare.com/blog/head-and-neck/oral-cancer-symptoms-diagnosis-and-treatment-options/

Prostate cancer

- A cancer in a man's prostate, a small walnut-sized gland that produces seminal fluid.





Sources: https://www.netmeds.com/health-library/post/prostate-cancer-causes-symptoms-and-treatment, https://www.verywellhealth.com/symptoms-of-prostate-cancer-2782274

Non-modifiable cancer risk factors

Age

Sex

Family History

Modifiable cancer risk factors

Smoking & Alcohol

- Physically Inactive

obesity

Unhealthy diet

Foods to avoid

- Processed meats
- Alcohol
- Sugar-sweetened bevera
- Processed foods- chips
- Raw Vegetables
- Unpasteurized Dairy Products

Foods to eat

https://curofy.com/discussion/nutritional-challenges-for-cancer-patients-

Chronic Respiratory Disease

Chronic respiratory Disease

- Chronic respiratory diseases (CRDs) affect the airways and other structures of the lungs.
- **asthma,**
- **chronic obstructive pulmonary disease (COPD),**

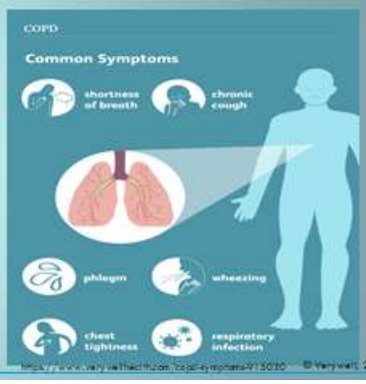
Asthma

- A condition in which a person's airways become inflamed, narrow and swell and produce extra mucus, which makes it difficult to breathe

Source: https://
https://www.pedilung.com/pediatric-lung-diseases-disorders/severe-asthma-children/

Chronic obstructive pulmonary disease (COPD),

- A group of lung diseases that block airflow and make it difficult to breathe.



Foods to eat	Foods to avoid
fruits and vegetable	chocolate and candies
whole grains, beans and lentils, legumes	sugary drinks
certain vegetable oils, such as olive oil	Deep fried foods-Samosa, bhajiya, french fries,etc.
Nuts, seeds	ice cream
eggs	processed meats
Milk & milk products	Margarine

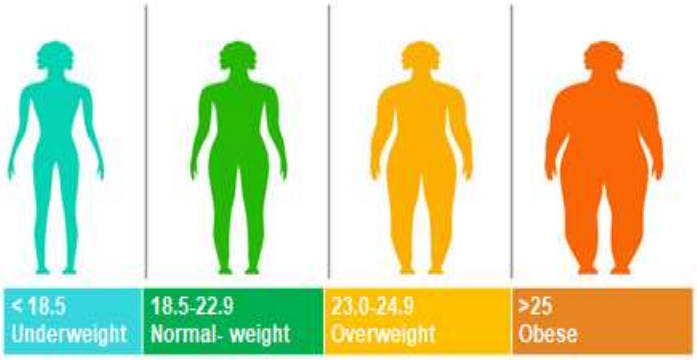
OBESITY

What is Obesity/Over weight

- Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 22.9 is considered overweight, and over 24.9 is obese.

Obesity classification according to WHO and Asia-Pacific guidelines

	WHO (BMI) kg/m^2	Asia-Pacific (BMI) kg/m^2
Underweight	<18.5	<18.5
Normal	18.5–24.9	18.5–22.9
Overweight	25–29.9	23–24.9
Obese	≥30	≥25



Classification according to Asia-Pacific

Indicator Of Obesity

- **Body Mass Index (BMI)**

BMI is an assessment of body weight related to height and in most people correlates highly with body fat. It is determined by weight in kilograms divided by height in meters squared (kg/m²).

- **Waist Circumference**

It is the best indicator to detect central obesity and most common way to measure "abdominal obesity"-the extra fat found around the middle that is an important factor in health, even independent of BMI. It's the circumference of the abdomen, measured at the natural waist (in between the lowest rib and the top of the hip bone), the umbilicus (belly button), or at the narrowest point of the midsection.

- Waist Circumference Cutoffs

Men : >90 cm

Women :>80cm

Waist-to-Hip Ratio

- Like the waist circumference, the waist-to-hip ratio (WHR) is also used to measure abdominal obesity. It's calculated by measuring the waist and the hip (at the widest diameter of the buttocks), and then dividing the waist measurement by the hip measurement.
- Cutoffs

Men >0.96-1.00

Women >0.81-0.85

Manage Obesity

- **Exercise.** People with obesity need to get at least 70-150 minutes a week of moderate-intensity physical activity (30 minutes brisk walking everyday)to prevent further weight gain or to maintain the loss of a modest amount of weight.

Foods to Include

- Dark Green Leafy Vegetables
- Oats, Muselli.
- Citrus Fruits
- Carrots, Raddish, Beetroot
- Walnuts, Almond, Flaxseeds.
- Huge serving of salad before meal
- Adequate amount of fluids: Juices, water, dals, soups, buttermilk.
- Use skimmed milk
- Use cow milk instead buffalo milk
- Whole grains instead refined ones.

Foods to avoid

- Soft drink
- Chips
- Processed food
- Excess saturated food
- Chocolates
- Junk foods
- Canned foods
- Bakery products

PHYSICAL ACTIVITY

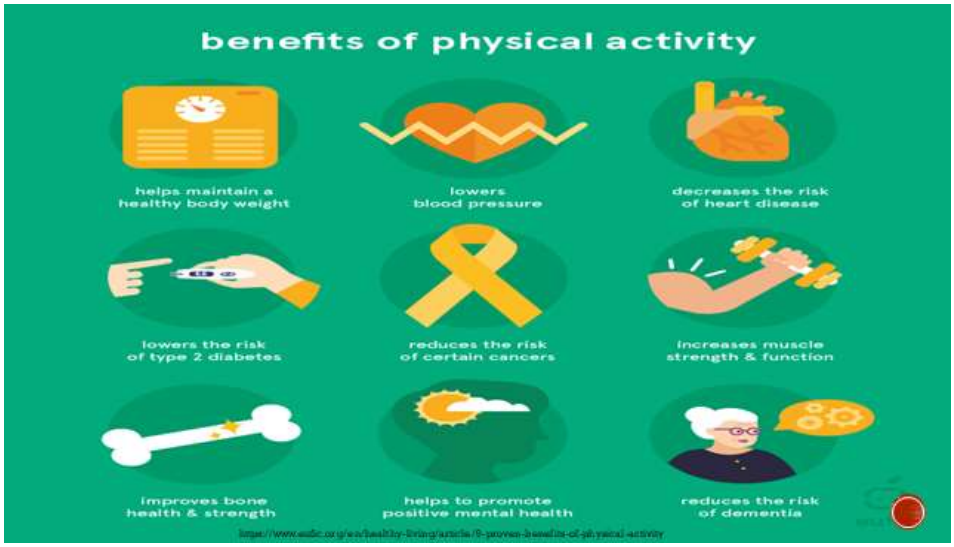
https://www.freepik.com/premium-vector/physical-activity-healthy-people-lifestyle_7008480.htm

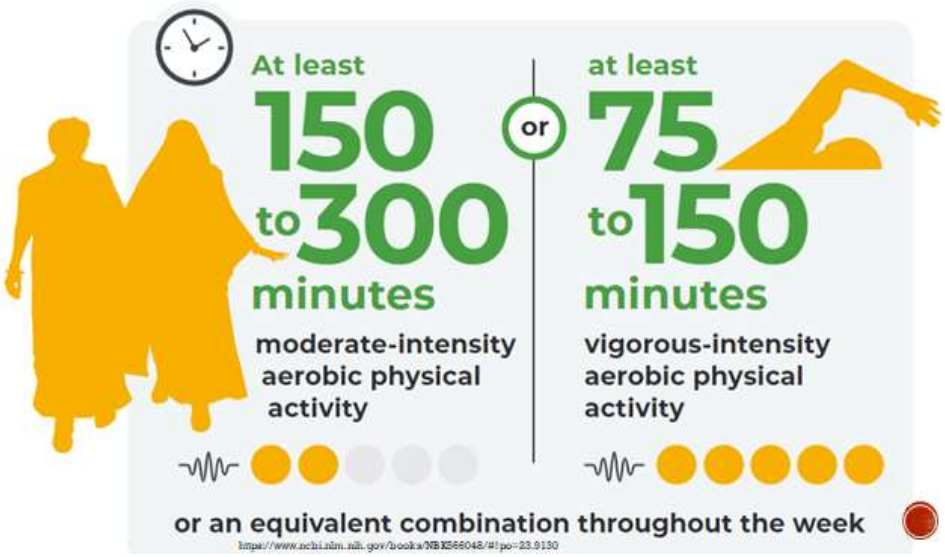
Title: Intervention to Control NCDs & NCD Risk Factors among the University Employees :–
Dr. Sonal Mishra, Prof. Annie Kuruvilla & Reema Patel

INTRODUCTION

- Regular physical activity is proven to help prevent and manage noncommunicable diseases (NCDs) such as heart disease, stroke, diabetes and several cancers. It also helps prevent hypertension, maintain healthy body weight and can improve mental health, quality of life and well-being.

https://www.freepik.com/premium-vector/physical-activity-healthy-people-lifestyle_7008480.htm





GOALS FOR MOST ADULTS TO PROMOTE WEIGHT LOSS AND MAINTAIN A HEALTHY WEIGHT INCLUDE:

Aerobic Fitness

Defined- The body's ability to take in and use oxygen to produce energy. Aerobic activities make you breathe hard & increase the heart rate.

Some of these activates :

- Jogging
- Walking
- Cross-country skiing
- Bicycling

MUSCULAR FITNESS

- Defined – The strength and endurance of your muscles.

Benefits:

- Improve performance
- Injury Prevention
- Improves body composition
- Improves self image

MUSCLE STRENGTHENING ACTIVITY

- Planks
- Push up
- Russian Twist
- Wall Push up
- Sit up
- Squats
- Trice Dips
- Side Plank

YOGA

- Ardha-halasana- This yoga asana relieves constipation. It improves circulation. It helps strengthen thigh and calf muscles. It can help you lose weight and reduce belly fat.
- Bhujangasana- It is known to improve blood circulation and keep the heart healthy. This yoga asana involves stretching the chest, shoulders and abdomen, and thereby helps release tension.

- Pranayama- It helps to Decreases stress, Improves sleep quality, Reduces high blood pressure, Improves lung function.
- Trikonasana- A major side effect of diabetes is damaging kidneys. This asana reverses this effect and also betters digestion and absorption in the body.
- Tadasana - It help to improve blood circulation, improve breathing, promotes weight loss.

Tadasana

Moderate Exercise

Aerobic Activities	Time	Cal Burn
1. Walking(slow)	30min.(1.8 km)	65cal
2. Bicycling	30min.(4 km)	45cal
3. Running /Treadmill running (slow)	30min. (8km/hr.- 4km)	296cal
4. Jogging	30min. (2km)	109kcal

Vigorous Exercise

Aerobic Activities	Time	Cal Burn
1. Walking(Fast)	30min.(1.8 km)	65cal
2. Burpees	30 sec (repeat 5 time)	2cal
3. Running /Treadmill running (Fast)	30min. (12km/hr.- 6km)	444cal
4. High Knees	30sec. (repeat 5 time)	2cal
5. Skater Jumps	30sec. (repeat 5 time)	2cal
6. Reverse Lunge	30sec. (repeat 5 time)	2cal

Muscle Strengthen Activities	Time	Cal Burn
1. Squats In & Out	30 sec (repeat 5 time)	2cal
2. Cross Body Mountain Climber	30 sec (repeat 5 time)	2cal
3. Spiderman Plank	30 sec (repeat 5 time)	2cal
4. Push up & Mountain Climber	30 sec (repeat 5 time)	2cal
5. Russian Twist	30 sec (repeat 5 time)	1cal
6. Trice Dips	30sec. (repeat 5 time)	2kcal

Exercise Schedule

Yoga Asana

	Time
Pranayama	Repeat 5 time
Ardha-halasana	Repeat 5 time
Bhujangasana	Repeat 5 time
Trikonasana	Repeat 5 time
Tadasana	Repeat 5 time

Warm-up	Time	Cal. Burns
High knee march	Repeat 12 times	2cal.
10 sec Reset		
Side Bend	Repeat 12 times	2cal.
10 sec Reset		
Back turn	Repeat 12 times	2cal.
10 sec Reset		

Set 1	Time	Cal. Burns
Crossbody Mountain Climber	30sec	2cal.
10 sec Reset		
Burpees	30sec	2cal.
10 sec Reset		
In & Out squat	30sec	2cal.
10 sec Reset		
Mountain Climber	30sec	2cal.
10 sec Reset		
Skater Jumps	30sec	2cal.
10 sec Reset		

Set 2	Time	Cal. Burns
Plank Jacks	30sec	2cal.
10 sec Reset		
Reverse Lunge	30sec	2cal.
10 sec Reset		
Jumping Jacks	30sec	2cal.
10 sec Reset		
Bicycle Crunch	30sec	2cal.
10 sec Reset		
Russian Twist	30sec	2cal.

Promoting Healthy Diets to Prevent Non-Communicable Diseases

Healthy diet

- A diet consuming which throughout the life-course helps to prevent malnutrition in all its forms as well as a range of non communicable diseases (NCDs) and conditions.
- The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

https://www.who.int/news-room/fact-sheets/detail/healthy-diet

Source: My plate, National Institute of Nutrition, ICMR, India,2019.

Benefits of consuming food as per 'My plate':

- Improves immunity and resistance to infection.
- Helps maintain good microbial flora
- Prevents Diabetes mellitus, Cardiovascular disease such as heart attach, stroke and many other diseases.
- Maintain appropriate alkalinity and thereby reduces inflammation and decreases chances of kidney stone formation.
- Prevents insulin resistance and maintain appropriate insulin sensitivity and glycemic index.
- Ensures adequate intake of fiber and therefore prevents constipation.

Recommended Daily Amounts of Fruits and vegetables

Fruits
- 2 1/2 cups day

Vegetables
- 3 cups day

1 cup of Fruits
1 cup of 100% Fruit juice
1 cup of dried fruit

1 cup of raw or cooked vegetables
1 cup of vegetablesjuice
2 cup of leafy greens

HEALTHY DIETS IN NON-COMMUNICABLE DISEASES

- Eat more vegetables (350 gm)and fruits (150 gm)daily.
- Swap refined grains with whole grains, cereals and millets like sorghum(jowar), pear millet (bajra), finger millet (ragi), foxtail millet etc.
- Use dal and pulses like kidney beans, chickpea, green gram etc.
- Consume low-fat(skimmed) milk and milk products like curd, buttermilk and cottage cheese (panner).
- Choose low GI Fruits and Vegetables greens and other vegetables .
- Take handful of mixed nuts (Almonds, walnuts, pistachios, etc.) replacing one cereal exchange(20gm).
- Fats consumption should be less than 30% of total energy intake . Unsaturated fats (found in fish, flax seeds avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard). Avoid trans-fats of all kinds.

Vitamins

	Vitamins	Functions
Fat-Soluble Vitamins	Vitamin A	Keeps skin and hair healthy, aids in night vision and plays a role in developing strong bones & teeth.
	Vitamin D	Helps build strong bones & teeth and helps body use calcium and phosphorus.
	Vitamin E	Helps to form red blood cells, muscle and other tissues.
	Vitamin K	Helps in clotting of blood.
Water-Soluble Vitamins	Vitamin B group	Helps body to use the energy from foods we eat and helps in brain, nerves and muscle function.
	Vitamin C	Helps in healing of wounds, maintaining healthy bones, teeth, blood vessels and helps body to fight infection.

Minerals

- Important macro minerals required by our body includes calcium, phosphorus, magnesium, sodium, potassium and iron.
- While zinc, copper, iodine, sulfur, chloride etc. are the micro minerals required by our body.

(Image: Shutterstock)

Iron

Function: Helps make hemoglobin in red blood cells and helps cells use oxygen.
Food Source: liver, kidney, heart, meat, egg york, dried beans and peas, spinach, dried fruits, whole-grain, cereals and nuts.

(Image: Pinterest)

Iodine

Function: Needed for thyroid gland function.
Food Source: Seafood, iodized salt and drinking water (in regions with iodine-rich soil, which are usually regions near the water bodies).

Source: dinosaurians.info

Potassium

Function: Helps in normal nerve and muscle function and maintaining the right amounts of water in different parts of the body.
Food Source: Milk, banana, tomatoes, oranges, melons, potatoes, sweet potatoes, raisins, spinach, turnip greens, peas and beans.

https://www.healthifyme.com/blog/sources-of-sodium-in-food/

Sodium

Function: Helps maintain the right balance of fluids in the body. Transmit nerve impulses and influences contraction and relaxation of muscles.

Food Source: Processed and packed foods: canned vegetables, soups, pickles, meats, frozen foods, chips and namkeens.

Condiments: table salts, soy sauce, ketchup, mustard etc. And natural source like some meats, poultry, dairy products (like cheese) and vegetable.

Calcium and Phosphorus

Function: Helps to build and maintain healthy bones and teeth. Also helps heart, nerves and muscles work properly.

Food Source: Dairy product: milk, cheese, ice-cream, green leafy vegetables, canned sardines and other processed fish eaten with bones.

https://www.plantpoweredkidneys.com/low-phosphorus-foods/

Balanced Diet

- A balanced diet is one which provides all the nutrients in required amounts from different food groups on a regular basis

https://soulfulpalate.com/indian-meals-a-complete-balanced-diet/

How to achieve a Balanced Diet?

- Consume a variety of fresh, colorful and locally available fruits & vegetables.
- Eat whole grains, cereals and pulses (with outer covering) and their products.
- Eat whole fruits as they are rich in natural fiber.
- Limit the consumption of refined grains, including foods made with maida.
- Try including foods from each food group in the diet.
- Choose vegetable oils like mustard oil, groundnut oil, soybean oil, etc. for cooking/frying. It is better to use varieties of oils in rotation.
- Ensure moderate use of edible oils and animal foods.
- Limit the use of butter/ghee and avoid vanaspati and use of re-heated fats and oils.
- Drink plenty of water daily. Beverages like water, buttermilk, lassi, coconut water, lemon water/nimbu paani, aam pana, kokum, sattu, etc. should be consumed instead of cold drink and fruit juices.

Food pyramid

- The Food Pyramid is a guide to be used by the health population for the amount and types of foods to be included in the daily diet in order to stay healthy.
- It is a pictorial representation of different food groups and the quantity in which they should be consumed.

https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/india/en/

WHO Guidelines for Healthy Diet

• Fruits, vegetable, legumes, nuts and whole grains (e.g. maize, millets, oats, wheat and brown rice)
• At least 400g (i.e. five portions) of fruits and vegetable per day, excluding potatoes, sweet potatoes and other starchy roots.
• Less than 5% of total energy intake from free sugars, which is equivalent to 25 g (about 6 teaspoons) per day.
• Less than 30% of total energy intake from fats, which is equivalent to 30g per day.
• Less than 5 g of salt (equivalent to about one teaspoon) intake per day.

Unhealthy Diet

- A diet rich in sugar, salt, fat, foods such as red meat- mutton, liver; milk and milk products such as full cream milk, butter, ghee but low in the amount of fruits and vegetables is called an Unhealthy diet.

DASH diet for Hypertension
(Dietary Approach to Stop Hypertension)

https://www.diploods.com/blog/trending-diets-of-today-and-how-to-incorporate-them-in-your-life-daily/

- It is a lifelong approach to healthy eating that is designed to help treat or prevent high blood pressure (hypertension).
- It encourages to reduce the sodium, fat and alcohol in the diet and eat a variety of foods rich in nutrients like potassium, calcium & magnesium that helps to lower the blood pressure.
- The regular DASH diet recommends not more than 1 teaspoon(2300mg) of sodium per day.
- Other health benefits of DASH diet: prevents cancer, heart disease, stroke, diabetes & osteoporosis.

Fortified foods

Food fortification is the addition of key vitamins and minerals (micronutrients) such as iron, iodine, zinc, vitamin A and vitamin D to certain staple foods such as wheat flour, rice, salt, milk and oil to improve their nutritional status.

Micronutrients such as vitamins and minerals are required for the normal functioning of the human body. Which we usually get through our daily diet . Dietary diversification, i.e. eating a variety of foods from all food groups will fulfill the micronutrient demands. Another simple method is to eat fortified staple foods.

Benefits of Fortified Foods

- Fortified foods provide essential vitamins and minerals that may be missing in the diet.
- Fortified foods are safe to eat and do not pose any health risk. The amount of vitamins and minerals added is very small and standardized. So, the chance of an overdose or harmful effects is unlikely.
- Fortified foods look, taste, smell and feel the same as non-fortified foods.
- Fortified foods are cooked and stored in the same manner as non–fortified foods

Role of Functional Foods in Preventing NCDs

- Functional foods have active compounds like vitamins, probiotics, antioxidants, fibers, etc. that support health and help to prevent various diseases.

Functional foods are generally classified into two group:	
Conventional Foods	Natural, whole-food ingredients that are rich in active compounds. Example: Pears, apples, oranges, bananas, cauliflower, spinach, almonds, cashews, flax seeds, barley, ragi, etc.
Modified Foods	Foods fortified with additional ingredients, such as vitamins, minerals, probiotics or fiber to increase health benefits.

Advantages of functional foods:
• Can be consumed three or more times a day as needed.
• Available locally & seasonally and is priced reasonably.
• Causes no unhealthy side effects when consumed according to guidelines.
• Tastes good and is proven effective throughout a long history of use.
• Is suitable for all ages and needs no prescription.

Herb/Spice	Gujarati Name	Health Benefit
Fenugreek seeds	Methi	Improves blood sugar levels, reduces cholesterol, has anti-inflammatory effects and controls appetite.
Garlic	Lasun	Keeps blood vessels flexible, helps to reduce cholesterol and triglyceride levels.
Turmeric	Haldi	Helps to reduce inflammation and improves heart health.
Cumin	Jeeru	Aids in digestion, lowers blood sugar levels, increases insulin sensitivity, protects against heart diseases.
Coriander	Dhana	Helps to lower blood pressure, blood sugar levels and cholesterol levels.
Cinnamon	Dalchini	Helps to reduce cholesterol level and lowers blood sugar levels.
Cardamom	Elaichi	Lowers blood pressure, improves breathing and helps to heal stomach ulcers.

Herb/Spice	Gujarati Name	Health Benefit
Basil	Tulsi	Protects against cancers, regulates blood sugar levels, lower cholesterol and triglycerides.
Ashwagandha	Ashwagandha	Lowers blood sugar levels, manages stress & lowers anxiety.
Cloves	Laung	High in antioxidants, protects against cancers, helps in regulating blood sugar and promotes good bone health.
Dry Ginger	sonth	Helps in weight loss and indigestion, lowers blood sugar levels and cholesterol and improves metabolism.
Flax Seeds	Alsi	Improves digestion, reduces risk of heart diseases, diabetes and cancers.
Garden Cress Seeds	Asadiyo	Rich in iron and fiber, helps in weight loss, lowers blood sugar levels and boost immunity.
Chia seeds	Chia seeds	Rich in antioxidants and fiber, lowers blood sugar levels and risk of heart diseases, helps with weight loss and is good for bone health.

Energy giving FOODS

Rice, wheat oats, corn, ragi & bajra

Ghee/Oil

Ginger, Potato, GLVs(Green leafy Vegetables & Beetroot

Body Building/Protein Foods

Pulses

Milk & its product

Meat, Fish & Egg

Nuts

Eat Right India - Aaj Se Thoda Kam

- Food Safety and Standards Authority of India(FSSAI) launched ' Aaj Se Thoda Kam' campaign as a preventive healthcare measure to address various lifestyle related to non-communicable diseases.
- The campaign aims to promote reducing of salt, sugar and fat intake by delivering the message very effectively and educating people through communication material

fssai

भारतीय खाद्य संरक्षा एवं मानक प्राधिकरण

विश्वास का वायदा, सुरक्षित एवं पौष्टिक खाद्य का आश्वासन

स्वास्थ्य एवं परिवार कल्याण विभाग, भारत सरकार

https://fssai.gov.in/

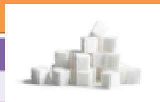
NAMAK KAM

- Salt is the main source of sodium in the diet.
- High sodium is a risk factors for high blood pressure, which leads to heart problems.
- An average Indian consumes nearly double the recommended amount of salt everyday.

Tips to reduce salt consumption
• Gradually reduce the use of salt in the daily diet.
• Track and monitor the consumption of salt at home.
• Do not add salt to rice or to atta while cooking chapattis
• Avoid sprinkling salt on, cut fruits, curd and even cooked food.
• Consume moderate quantities of foods, such as papads, pickles, sauces, ketchups, salted biscuits, etc. that are high in sodium.
• Limit the intake of foods described as pickled, brined, barbecued, cured or smoked as they tend to be high in sodium.
• Drink plenty of water everyday to flush out toxins and excess of sodium from the body.
• Eat fruits and vegetables, which are rich in potassium to neutralize the effect of sodium in the body.

CHEENI KAM

- High intake of sugar is a risk factor for obesity and can lead to diabetes and other diet-related non-communicable diseases.



Tips to reduce sugar consumption:
• Gradually reduce the use of sugar in the daily diet.
• Track and monitor the consumption of sugar at home
• Use naturally sweet ingredients rather than refined sugar. For example, in fruit-based desserts add more fruits for natural sweetness.
• Limit the intake of cakes, pastries, confectioneries and sweets prepared with refined cereals containing high amounts of sugar.
• Instead of drinking fruit juices, eat fresh whole fruits.
• Limit the consumption of sugar-sweetened beverages and sugary snacks.
• Limit the amount of desserts and use less sugar in preparing them.

GHEE-TEL KAM

Excess of fat intake is a risk factor for obesity and non-communicable disease like diabetes and heart diseases.

Tips to reduce fat consumption:
• Gradually reduce the use of oil in the diet.
• Track and monitor the consumption of oil at home.
• Measure cooking oil with small spoon rather than pouring freely from the bottle.
• Change the type of oil every three months and use two different types of oil at a time.
• Do not repeatedly reheat oil or re-use the same oil for frying or cooking.
• Avoid frying as much as possible. Instead boil, steam, roast or grill food.
• Moderate the use of butter, ghee and vanaspati that is rich in saturated or trans- fats.
• Moderate the consumption of bakery products or processed foods high in fat.
• Choose lean meat sources like chicken or fish instead of red meat or organ meat.

Foods to be used in moderation

- Trans fat & saturated fat food items like bhajiya, samosa, gota, margarine, palm oil, vanaspati and butter etc.
- Extra salt, salt shaker on dining table, pickles, papad, canned foods, preserved foods, sauces, jams, jellies, ketchup, instant soups, packaged foods.
- Salted nuts, chips, bread, popcorn etc.
- Bakery products like biscuits, cookies, bread, cakes, puffs, khari, etc.
- Carbonated beverages, sweets, ice cream and chocolates.

Limiting these foods in your daily diets and snacks

Unhealthy Diet as a risk factor for NCDS

WHAT PREVENTS US FROM FOLLOWING A HEALTHY DIET?

Poor Knowledge

Easily availability of fast food

Attractive Advertisement

HOW TO OVERCOME BARRIERS TO HEALTHY DIET

- Identify the barrier to an unhealthy diet and work on them
- When planning a daily meal choose seasonal and locally available food so that the cost can be reduced
- Whenever there is stress, try and engage in some kind of relaxation or physical activity or even talk to someone instead of over-eating or under-eating .
- Understand that unhealthy diets lead to NCDs and other health problems.

Cardiovascular Diseases | Diabetes | Chronic Respiratory Diseases | Cancer

Benefits of Healthy Diet

- It protects against many chronic non communicable diseases, such as heart diseases, diabetes and cancers.
- People with diets rich in vegetables and fruits have significantly lower risk of obesity, heart diseases, stroke, diabetes and certain types of cancers.
- Using unsaturated vegetable oils (olive, soy, sunflower or corn oil) rather than animal fats or oils high in saturated fats (butter, ghee, lard, coconut and palm oil) will be a healthier option.
- Keeping the salt intake to less than 5gm per day helps prevent hypertension and reducesthe risk of heart diseases and stroke in the adult population.
- Maintaining a healthy weight and eating a balanced diet that is low in saturated fat and high in fibre found in whole grains can help to reduce the risk of developing type 2 diabetes.
- A healthy diet rich in fruits, vegetables, whole grains and low-fat dairy can help to reduce the risk of heart diseases by maintaining blood pressure and cholesterol levels.

Fruits energy contain of common foods

Sr. No.	Item	Quantity/Size	Weight (Grams)	Calories
1	Banana	1 no	101	117
2	Orange	1 no	184	88
3	Custard apple	1 no	170	160
4	Papaya	1 pcs.	145	46
5	Chiku	1 cup	241	236
6	Pomegranate	1 cup	174	144
7	Water melon	1 cup	154	25
8	Pineapple	1 cup	165	76
9	Graps	1 cup	151	107

Vegetables energy contain of common foods

Sr. No.	Item	Quantity/Size (Cup)	Weight (Grams)	Calories
1	Cabbage	1	100	
2	Ladyfinger/Ghiloda	1	100	68
3	Cauliflower	1	100	81
4	Dudhi	1	100	50
5	Suran(Yam)	1	100	90
6	Sev tomato	1	130	149
7	Brinjal & Potato	1	100	81
8	Tuver dal	1	150	116
9	Gujarati sweet kadhi	1	150	69

Thank you