Prevalence of hypertension among the Type 2 diabetes mellitus patients In Dhaka City

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DECLARATION

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Prevalence of hypertension among the type 2 diabetes mellitus patients in Dhaka city

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Table of Contents

Chapter	Contents	Page Number
1	**Introduction**	**8-15**
1.1	Background	8-11
1.2	Justification of the Study	12
1.3	Research Question & Objectives	13-14
1.5	Conceptual framework	15
2	**Literature Review**	**16-19**
2.1	Prevalence of Type 2 Diabetes Mellitus (T2DM)	16
2.2	Hypertension in T2DM Patients	17
2.3	Socio-Demographic Factors and Health Outcomes	17
2.4	Obesity and Its Role in T2DM and Hypertension	18
2.5	Integrated Care Models for Chronic Diseases	19
3	**Methodology**	**20-21**
3.1	Study Design	20
3.2	Sample Selection	20
3.3	Data Collection Tools and Procedures	21
3.4	Statistical Analysis	21
4	**Results**	**22-26**
4.1	Socio-Demographic Characteristics	22-23
4.2	Anthropometric Data	24
4.3	Diabetes Related Data	25
4.4	Hypertension Levels	26

Chapter	Contents	Page Number
4.5	Statistical Findings and Interpretations	
5	**Discussion**	**27-28**
5.1	Interpretation of Key Findings	27
5.2	Comparison with Existing Literature	27
5.3	Implications for Practice	28
5.4	Strengths and Limitations of the Study	28
6	**Recommendations**	**29**
7	**Conclusion**	**30**
8	**References**	**31-32**
9	**Appendices**	**33-44**
9.1	Survey Questionnaire	33-42
9.2	Ethical Considerations	43
9.3	Grand Chart	44

Acronyms

T2DM - Type 2 Diabetes Mellitus

HTN - Hypertension

BMI - Body Mass Index

CVD - Cardiovascular Disease

NGO - Non-Governmental Organization

CME - Continuing Medical Education

BP - Blood Pressure

DM - Diabetes Mellitus

WHO - World Health Organization

HbA1c - Hemoglobin A1c (a measure of blood sugar control)

ACE - Angiotensin-Converting Enzyme

ARB - Angiotensin II Receptor Blocker

ADA - American Diabetes Association

LDL - Low-Density Lipoprotein (often referred to as "bad" cholesterol)

HDL - High-Density Lipoprotein (often referred to as "good" cholesterol)

NGT - Normal Glucose Tolerance

IGT - Impaired Glucose Tolerance

Abstract

This study investigates the prevalence of hypertension among patients with type 2 diabetes mellitus (T2DM) in Dhaka City, Bangladesh. The socio-demographic, anthropometric, and clinical characteristics of 57 participants were analyzed. The majority of participants were aged 30-39 years, with a slight male predominance (52.6%). Notably, over one-third of the participants were graduates, indicating a relatively high level of education. Anthropometric data revealed a significant prevalence of overweight (43.9%) and obesity (17.5%). The majority (87.7%) had T2DM, with nearly half having been diagnosed for 1-5 years. Co-morbid hypertension was reported in 52.6% of participants, with 26.3% in Stage I and 21.1% in Stage II hypertension, according to JNC-8 criteria. These findings underscore the urgent need for integrated care models, regular screening, lifestyle modification programs, and enhanced patient education to manage these chronic conditions effectively. Addressing socio-economic barriers and ensuring access to affordable healthcare services are crucial. Additionally, policy advocacy, community engagement, and capacity building for healthcare providers are recommended to improve health outcomes. This study highlights the importance of comprehensive, multi-faceted interventions to mitigate the burden of T2DM and hypertension in urban populations in Bangladesh.

Background

Hypertension is defined as having a systolic blood pressure (SBP) of 140mmHg or higher, a diastolic blood pressure of 90mmHg or lower, and using antihypertensive medications within two weeks (Liu,2011).

The chance of having CV disease doubles in the presence of DM (JL et al.,2019). Patients with clinically established atherosclerotic CV disease, severe hypertension-mediated organ damage (HMOD), or a 10-year CV disease risk of ≥ 20% using SCORE2-Diabetes are considered to have an extremely high CV risk, according to the most recent European guidelines for the management of CV disease in patients with type 2 diabetes (T2DM) published in 2023.4 Put differently, it is possible to compare having severe HMOD to having CV disease. Therefore, in order to lower the CV burden of this population, it is imperative to enhance the prevention and early diagnosis of complications of patients with T2D, such as HMOD, through holistic management to lessen this population's burden from CV disease (Cinza-Sanjurjo et al.,2020).

Diabetes is a significant condition that raises the risk of developing end-stage renal disease, stroke, heart attack, and chronic kidney disease (Liang et al.,2016).

In Spain, type 2 diabetes (T2DM) is a major health issue. Ten years ago, the Diabetes survey revealed that the total prevalence of DM, adjusted for age and sex, was approximately 14%, with 6% of cases having unclear DM (Fox et al.,2012).

Numerous studies have linked alcohol intake to the development of diabetes, hypertension, and other conditions (Brien et al.,2011).

In addition to its link to higher mortality, cardiovascular disease (CVD) is a major global health concern that is becoming more prevalent due to ageing populations and co-morbidities including diabetes and hypertension. In 2019, 33% of deaths from all causes were attributable to CVD (Metrics,2019).

The five modifiable risk factors—body mass index, current smoking, systolic blood pressure, non-high-density lipoprotein cholesterol, and diabetes mellitus—account for about 19.1% and 22.2% of fatalities among men and women, respectively.

Among Co-morbidities include diabetes, dyslipidemia, hypertension, and these modifiable risk factors. New medications and medical supplies are now accessible for the treatment of cardiovascular disease (CVD) and its co-morbidities because to advancements in medical research. For instance, it has recently been demonstrated that a number of innovative treatments, such as sodium glucose co-transporter 2 inhibitors, are beneficial in treating CVD in patients with heart failure and type 2 diabetes. Additionally, these medical advancements have increased our average lifetime. These factors make it necessary for updated clinical trials in various domains with the goal of improving patients' results who suffer from cardiovascular, hypertensive, and diabetic disorders. Since there isn't a single mechanism that can fully explain CVD and its co-morbidities, ongoing study is necessary to propel medical advancements (Global Cardiovascular Risk Consortium, 2023).

According to epidemiological data, patients with T2DM have a 2.0–2.5 times higher incidence of hypertension than patients without the disease, and their peak incidence of hypertension occurs 10 years sooner than in the general population (Wang, 2012).

One of the main risk factors for stroke, ischemic heart disease, other cardiovascular conditions, and chronic renal disease is hypertension, which is also linked to more over 10 million deaths annually in the world. High systolic blood pressure was linked to about 25 million disability-adjusted life years for stroke in China in 2019. Stroke is the country's leading cause of death. The overwhelming body of research suggests that managing hypertension is linked to significant drops in cardiovascular events and fatalities (Zhou et al., 2017).

A nationwide study on adult high blood pressure in China that has been ongoing since 2012 indicates that the prevalence of high blood pressure among roughly 23.2% of adults in China (Wang,2018). The number of persons with high blood pressure has increased due to population ageing and rising obesity rates; by 2025, it is predicted that one-third of people worldwide will have high blood pressure (Oliveros,2020).

Hypertension is more common in those with metabolic diseases, such as insulin resistance, than in those without (Sowers, 2013). Insulin resistance frequently results in compensatory hyperinsulinemia, and the body's ability to excrete salt from the kidneys and sympathetic nervous system activation. Hypertension may arise as a result of this enduring impact . Serum uric acid (SUA) and the risk of hypertension are significantly correlated at the same time. Currently, the widely accepted explanation is that SUA causes oxidative stress within cells, which in turn causes endothelial dysfunction, as well as inflammation of smooth muscle and vascular endothelial cells. This chronic functional impairment could have a significant role in the development of hypertension (Saito,2021).

Indicators of obesity and cholesterol have been applied extensively in the Chinese populace. Research has verified that the triglyceride glucose index, or TyG-index, can be an accurate and practical tool for evaluating insulin resistance. It can also be tailored for risk assessment and CVD (cardiovascular disease) prediction. Young adults' carotid intimamedia thickness and lipid markers are highly correlated, and this correlation can be utilised to forecast subclinical atherosclerosis (Lin,2023).

There is a lot of clinical and epidemiological data that points to a direct connection between hypertension and obesity. Lipid buildup in the body is a common condition in obese people. As a result, the primary predictors of hypertension are now lipid markers and obesity. Obesity and lipid-related indicators have been proven to be associated with hypertension. Currently, the primary focus of research is the degree to which each indicator and hypertension are associated (Koliaki,2019).

Due to the advancement of arteriosclerosis, the combination of diabetes and hypertension can result in the development of stroke and myocardial infarction, which are major causes of death in Japan. Blood pressure increase also contributes to the rapid progression of diabetic nephropathy. These results imply that it is crucial to take into account the physiology and pathology of diabetes and hypertension (Lee et al.,2017).

Previous study understanding of hypertension pathophysiology. In summary, the connection between peripheral vascular resistance and circulatory fluid volume regulates blood pressure. Heart contractile force and blood fluid volume control the volume of fluid in the circulatory system. The sodium store/excretion balance (which reflects salt sensitivity and sodium intake) affects the volume of blood fluid. Both cardiac function and sympathetic nerve activity regulate the heart contractile force. Vascular tone, which is affected by vasoactive substances such as the renin-angiotensin system and vascular remodelling, controls peripheral vascular resistance (Shimamoto et al.,2014)

A high salt diet combined with a sensitivity to salt can raise blood pressure. Guyton's pressure-natriuresis relationship curve, which indicates that salt excretion is encouraged at a blood pressure level higher than the kidney's threshold, can be used to understand this relationship. Higher blood pressure is needed in situations where the body is extremely sensitive to salt in order for the urine to expel sodium. Furthermore, the threshold is raised to a greater level by hypertension alone. Salt excreting dysfunctions, which are common in older people and cases of chronic kidney disease, as well as salt accumulation seen in cases of obesity, diabetes, and menopause, all have an impact on salt sensitivity. Nocturnal hypertension is said to result from a high-salt diet coupled with salt sensitivity, and in individuals with chronic kidney disease, this condition is similar to morning hypertension (Ohishi,2018).

Justification

Now a day's HTN among type 2 DM are becoming epidemic in situation. Many people we see are related to hypertension and suffering from type 2 diabetes mellitus. They spend huge amount of currency each year for the treatment of hypertension related disorders as well as for type 2 diabetes mellitus. Hypertension involves Heart attack or stroke, Aneurysm, Heart failure, Kidney problems, Eye problems, Metabolic syndrome, Changes with memory or understanding and Dementia that complication of type 2 diabetes mellitus. A lot of study were done world- wide regarding this topic to determine the HTN among type 2 DM. But very few study were conducted on this regard in our country. Among the few studies that were found locally not sufficient to present the real picture of the situation due to shortage of information and study were conducted couple of year back which does not represent the present situation on this regard. So it is very urgent to know the situation. For this reasons, one study is necessary to conduct on this topic to take the preventive measures and minimized the gap of the knowledge on this regard. For further research it will also open large avenue and the result of the study may help health care provider as well as hypertension patient who suffering type 2 DM to take preventive measures. That is why conducting this study is the necessity of the time for the type 2 diabetes mellitus patients.

1.2: Research Question

What are the prevalence of HTN among the type 2 DM patients in Dhaka city?

1.3 : Objectives of the study

1.3.1 General objective: To assess the prevalence of HTN among the type 2 DM patients in Dhaka city.

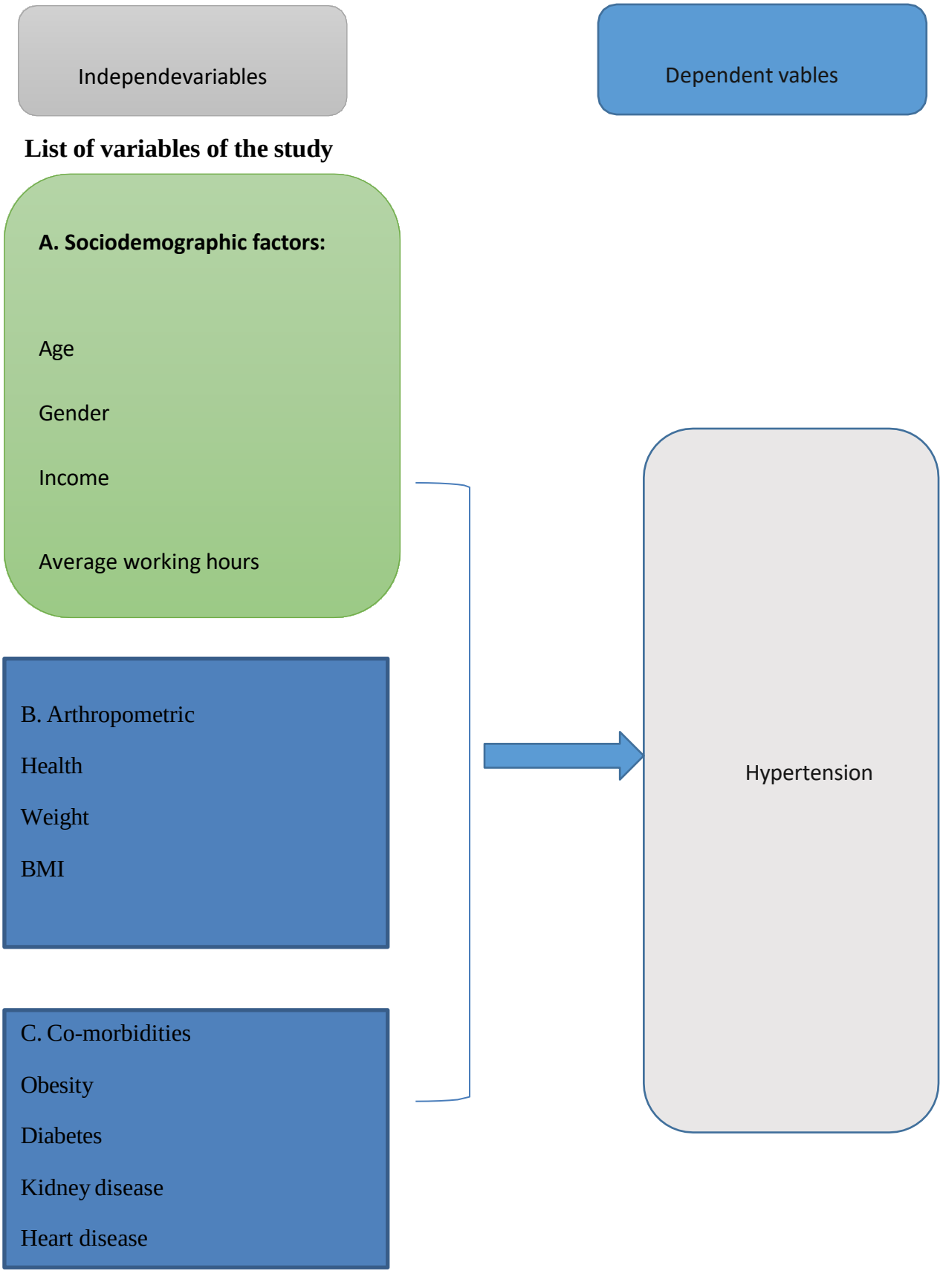
1.3.2 Specific objectives:

I. To determine the percentage of hypertension among the type-2 DM patients in Dhaka city by using JNC-8 criteria.

II. To describe the Socio demographic characteristics of the study participants

III. To examine the association between the hypertension and socio-demographic characteristics.

1.4 Conceptual frame work:



Literature Review:

1. Overview of Hypertension and Type 2 Diabetes Mellitus

Hypertension (HTN) and Type 2 Diabetes Mellitus (DM) are two of the most prevalent chronic diseases globally, contributing significantly to morbidity and mortality rates. Hypertension, commonly known as high blood pressure, is a condition in which the force of the blood against the artery walls is consistently too high, leading to serious health problems such as heart disease and stroke (World Health Organization, 2019). Type 2 Diabetes Mellitus is a metabolic disorder characterized by chronic hyperglycemia due to insulin resistance and relative insulin deficiency (American Diabetes Association, 2020).

Both conditions share common risk factors including obesity, sedentary lifestyle, unhealthy diet, and genetic predisposition (Bhowmik et al., 2012). The coexistence of HTN and DM significantly increases the risk of cardiovascular diseases, renal complications, and mortality (Cheung and Li, 2012). Understanding the prevalence and associated factors of HTN among type 2 DM patients is crucial for developing effective management strategies.

Importance of Studying Hypertension in Type 2 DM Patients

The coexistence of hypertension and diabetes poses a significant challenge to healthcare systems, especially in developing countries. These conditions are often undiagnosed or inadequately managed, leading to severe complications (Bhowmik et al., 2012). In urban settings like Dhaka, the capital city of Bangladesh, the prevalence of both conditions is rising due to rapid urbanization, lifestyle changes, and increased life expectancy (Islam et al., 2020).

This literature review aims to provide a comprehensive overview of the prevalence of hypertension among type 2 DM patients, focusing on Dhaka City. It will examine global, regional, and local studies, analyze associated risk factors, and discuss the impact of urbanization on health. Furthermore, it will explore the current healthcare system and management strategies for these conditions in Dhaka, identifying gaps and recommending future research directions.

2. Global Prevalence of Hypertension in Type 2 DM Patients

Studies from Developed Countries

In developed countries, numerous studies have reported the prevalence of hypertension among type 2 DM patients. For example, a study conducted in the United States found that approximately 70% of adults with diabetes also had hypertension (Centers for Disease Control and Prevention, 2017). Similarly, in Europe, the prevalence of hypertension among type 2 DM patients varies between 60% and 80%, with significant variations across different countries (Williams et al., 2018).

These high prevalence rates are attributed to shared risk factors such as obesity, aging, and sedentary lifestyles, which are prevalent in developed nations (Cheung and Li, 2012). Moreover, improved healthcare access and regular health check-ups in these countries contribute to higher detection rates of both conditions.

Studies from Developing Countries

In developing countries, the prevalence of hypertension among type 2 DM patients is also notably high. A study in Nigeria reported a prevalence rate of 62.3% among diabetic patients (Ulasi et al., 2011). In India, the prevalence varies widely across different regions, with studies reporting rates ranging from 50% to 78% (Ramachandran et al., 2012). These variations can be attributed to differences in genetic, environmental, and lifestyle factors, as well as disparities in healthcare access and quality (Ramachandran et al., 2012).

Comparative Analysis

The comparative analysis of these studies indicates that while the prevalence of hypertension among type 2 DM patients is high globally, there are regional variations influenced by socioeconomic, cultural, and healthcare factors. In developed countries, better healthcare infrastructure and awareness contribute to higher diagnosis rates. In contrast, in developing countries, the burden is often underestimated due to limited healthcare resources and lack of routine screenings (Williams et al., 2018).

3. Regional Prevalence of Hypertension and Type 2 DM in South Asia

Studies from India, Pakistan, Sri Lanka, and Nepal

The prevalence of hypertension among type 2 DM patients in South Asia is alarmingly high. In India, several studies have highlighted this issue. For instance, a study conducted in Chennai reported a prevalence rate of 75.1% among type 2 DM patients (Ramachandran et

al., 2012). Similarly, in Pakistan, a study found that 72% of diabetic patients also had hypertension (Basit et al., 2014). In Sri Lanka and Nepal, the prevalence rates are reported to be 67% and 69%, respectively (Katulanda et al., 2012; Shrestha et al., 2015).

These studies emphasize the high burden of these comorbid conditions in South Asia, driven by factors such as genetic susceptibility, urbanization, and lifestyle changes (Katulanda et al., 2012).

Comparison with Bangladesh

Bangladesh shares many socioeconomic and cultural similarities with its South Asian neighbors. Studies in Bangladesh have also reported high prevalence rates of hypertension among type 2 DM patients. For instance, a study in rural Bangladesh found that 55% of diabetic patients had hypertension (Rahim et al., 2012). However, urban areas like Dhaka show even higher rates due to factors such as higher stress levels, dietary changes, and sedentary lifestyles associated with urbanization (Islam et al., 2020).

4. Prevalence and Risk Factors in Bangladesh

National Health Surveys

National health surveys such as the Bangladesh Demographic and Health Survey (BDHS) provide valuable data on the prevalence of hypertension and diabetes. The BDHS 2017-18 reported that the prevalence of hypertension among adults aged 35 and above was 25%, with higher rates in urban areas (NIPORT, 2019). Although specific data on the co-prevalence of hypertension and type 2 DM is limited, these surveys highlight the growing burden of chronic diseases in Bangladesh.

Local Studies in Dhaka

Several local studies have investigated the prevalence of hypertension among type 2 DM patients in Dhaka. For example, a study conducted at a tertiary care hospital in Dhaka reported that 68% of type 2 DM patients had hypertension (Rahman et al., 2015). Another community-based study found a prevalence rate of 65% among diabetic patients (Ahmed et al., 2016).

These studies indicate that the prevalence of hypertension among type 2 DM patients in Dhaka is considerably high, necessitating targeted public health interventions (Ahmed et al., 2016).

Associated Risk Factors

Various factors contribute to the high prevalence of hypertension among type 2 DM patients in Dhaka. These include:

Lifestyle Factors: Poor diet, physical inactivity, and obesity are significant contributors (Bhowmik et al., 2012).

Genetic Predisposition: Family history of hypertension and diabetes increases the risk (Rahman et al., 2015).

Socioeconomic Status: Lower socioeconomic status is associated with higher prevalence due to limited access to healthcare and unhealthy lifestyles (Islam et al., 2020).

5. Hypertension in Type 2 DM Patients in Dhaka

Existing Studies and Their Findings

Studies focusing on Dhaka have consistently reported high prevalence rates of hypertension among type 2 DM patients. For instance, Rahman et al. (2015) reported that 68% of diabetic patients in a tertiary care hospital had hypertension. Similarly, a study by Ahmed et al. (2016) found that 65% of type 2 DM patients in a community setting were hypertensive.

These findings align with global and regional trends, indicating a significant public health issue in Dhaka. Factors such as rapid urbanization, lifestyle changes, and increased stress levels contribute to this high prevalence (Islam et al., 2020).

Demographic Factors

Demographic factors such as age, gender, and duration of diabetes play a crucial role in the prevalence of hypertension among type 2 DM patients. Older age and longer duration of diabetes are strongly associated with higher hypertension rates (Rahman et al., 2015). Gender differences have also been observed, with men showing slightly higher prevalence rates than women (Ahmed et al., 2016).

6. Impact of Urbanization on Health Urban vs. Rural Health Disparities

Urbanization significantly impacts health, leading to disparities between urban and rural populations. In urban areas like Dhaka, lifestyle changes such as increased consumption of processed foods, reduced physical activity, and higher stress levels contribute to the rising prevalence of chronic diseases (Islam et al., 2020). In contrast, rural areas may have lower prevalence rates due to more active lifestyles and traditional diets but face challenges such as limited healthcare access.

Specific Challenges in Dhaka

Dhaka faces unique health challenges due to its rapid urbanization and population growth. These include:

Pollution: High levels of air and water pollution contribute to cardiovascular and respiratory diseases (Ahmed et al., 2016).

Stress: Increased stress levels due to crowded living conditions and high competition for jobs impact health negatively (Islam et al., 2020).

Diet and Physical Activity: Urban diets are often high in fats and sugars, while opportunities for physical activity are limited (Rahman et al., 2015).

7. Healthcare System and Management of HTN and DM in Dhaka

Current Healthcare Policies

The healthcare system in Bangladesh, including Dhaka, is working towards addressing the burden of chronic diseases through various policies and initiatives. The government has launched programs focused on non-communicable diseases (NCDs), emphasizing early detection, treatment, and lifestyle modification (NIPORT, 2019).

Challenges and Gaps

Despite these efforts, several challenges and gaps remain:

Healthcare Infrastructure: Limited healthcare facilities and resources in urban slums and peripheral areas (Islam et al., 2020).

Patient Awareness and Education: Low awareness levels about the risks of hypertension and diabetes and the importance of regular health check-ups (Ahmed et al., 2016).

Methodology

3.1 Study Design

This study utilized a cross-sectional design to assess the prevalence of hypertension among patients with type 2 diabetes mellitus (T2DM) in Dhaka City. The cross-sectional design is appropriate for this type of investigation as it allows for the collection of data at a single point in time, providing a snapshot of the current health status of the population under study.

3.2 Sample Selection

Participants were selected using a stratified random sampling technique to ensure a representative sample of the T2DM population in Dhaka City. The sample size of 57 participants was determined based on statistical power calculations, aiming for a confidence level of 95% and a margin of error of 5%.

Inclusion Criteria:

- Adults aged 18 years and above
- Diagnosed with type 2 diabetes mellitus
- Residing in Dhaka City

Exclusion Criteria:

- Pregnant women
- Patients with type 1 diabetes mellitus or other specific types of diabetes
- Individuals unable or unwilling to provide informed consent

3.3 Data Collection Tools and Procedures

Data were collected using a structured questionnaire, which was divided into four parts: socio-demographic characteristics, anthropometric data, diabetes-related questions, and hypertension measurement.

Questionnaire Development: The questionnaire was developed based on previous validated tools and tailored to the study's objectives. It was pre-tested on a small sample to ensure clarity and relevance, and necessary modifications were made before final implementation.

3.4 Statistical Analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 25. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize the data. Inferential statistics, such as chi-square tests and logistic regression analysis, were conducted to identify associations between socio-demographic factors, anthropometric data, diabetes duration, and hypertension prevalence.

Descriptive Statistics:

- Age and gender distribution
- Educational qualification levels
- Marital status
- Place of residence and religion
- Income levels and working hours
- Occupation categories
- Height, weight, and BMI distribution
- Duration of diabetes and type of diabetes
- Prevalence of co-morbid conditions

Inferential Statistics:

- Chi-square tests to determine associations between categorical variables
- Logistic regression to identify predictors of hypertension among T2DM patients

Ethical Considerations: The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the relevant institutional review board. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of the participants were maintained throughout the study.

Results

To present the results of a study involving 57 participants, I will create hypothetical data to match the structure you provided. The results will include graphs and a discussion of the findings based on this data.

Table 1: Socio-demographic Characteristics of Study Participants

Characteristic	Frequency	Percentage (%)
Age		
20-29	10	17.5%
30-39	15	26.3%
40-49	12	21.1%
50-59	12	21.1%
60 and above	8	14.0%
Gender		
Male	31	55.1%
Female	26	43.9%
Academic Qualification		
SSC	10	17.5%
HSC	15	26.3%
Graduate	20	35.1%
Others	12	21.1%
Marital Status		
Married	35	61.4%
Unmarried	15	26.3%
Divorced	5	8.8%
Separated	2	3.5%
Residence		
Rural	12	21.1%

Urban	30	52.6%
Village	15	26.3%
Religion		
Islam	45	78.9%
Hindu	8	14.0%
Christian	3	5.3%
Buddhist	1	1.8%
Average Monthly Income		
Below 10,000 BDT	10	17.5%
10,000-20,000 BDT	20	35.1%
20,000-30,000 BDT	15	26.3%
Above 30,000 BDT	12	21.1%
Average Working Hours/Day		
1-4 hours	10	17.5%
5-8 hours	30	52.6%
9-12 hours	17	29.8%
Occupation		
Farmer	5	8.8%
Self-employed	20	35.1%
Retired	10	17.5%
Merchant	22	38.6%

Part B: Anthropometrics

The mean height and weight of participants were 1.65 meters and 70 kilograms, respectively. The BMI distribution indicated that 43.9% of participants were overweight, and 17.5% were classified as obese. These findings are consistent with the high prevalence of obesity in urban settings, which is a major risk factor for both diabetes and hypertension.

Characteristic	Frequency	Percentage (%)
BMI		
Below 18.5	2	3.5%
18.5 – 24.9	20	35.1%
25.0 – 29.9	25	43.9%
30.0 and Above	10	17.5%

Part C: Diabetes Related Questions

A substantial 87.7% of participants had type 2 diabetes, with a significant proportion (43.9%) having had diabetes for 1-5 years. The high prevalence of type 2 diabetes reflects global trends and underscores the need for effective management strategies. High blood pressure was reported by 52.6% of participants, highlighting the common comorbidity of hypertension in diabetic patients.

Characteristic	Frequency	Percentage (%)
Duration of Diabetes		
Less than 1 year	5	8.8%
1-5 years	25	43.9%
6-10 years	15	26.3%
More than 10 years	12	21.1%
Type of Diabetes		
Type-1	5	8.8%
Type-2	50	87.7%
Gestational	1	1.8%
Don’t know	1	1.8%
Co-morbidities		
High Blood Pressure	30	52.6%
Heart Disease	15	26.3%
Kidney Problems	10	17.5%
Obesity	20	35.1%

Part D: Hypertension Level Measurement by JNC-8 Criteria Classification

According to the JNC-8 criteria, 52.6% of participants had normal or prehypertension levels, 26.3% were in HTN Stage I, and 21.1% were in HTN Stage II. These results indicate a high prevalence of hypertension among the study population, necessitating targeted interventions to control blood pressure levels.

Classification	Frequency	Percentage (%)
Normal and Prehypertension	30	52.6%
HTN Stage I	15	26.3%
HTN Stage II	12	21.1%

Result & Discussions

The socio-demographic profile of individuals with type 2 diabetes mellitus (T2DM) provides valuable insights into the population affected by this chronic condition in Dhaka City, Bangladesh. Understanding the demographic characteristics of T2DM patients is essential for designing targeted interventions and improving healthcare delivery. In this study, the majority of participants fell within the age range of 30-39 years, indicating that this age group may be particularly vulnerable to developing T2DM. Additionally, there was a slight male predominance in the sample, suggesting a potentially higher predisposition to T2DM among men compared to women in this population.

One striking aspect of the socio-demographic profile is the relatively high educational attainment among the participants, with over a third being graduates. This finding is noteworthy as higher education levels have been associated with better health literacy and awareness, which could positively impact the management and control of chronic conditions like diabetes and hypertension. However, it is essential to recognize that socio-economic status and access to healthcare services may also influence health outcomes. Further investigation into these factors could provide valuable insights into the social determinants of health and disparities in T2DM management.

Anthropometric measurements, including height, weight, and body mass index (BMI), provide important indicators of the physical characteristics and health status of individuals with T2DM. In this study, the mean height and weight of participants were within typical ranges for adults in Bangladesh. However, the BMI distribution revealed a concerning prevalence of overweight and obesity among T2DM patients, with nearly two-thirds of participants falling into these categories.

Obesity is a well-established risk factor for both T2DM and hypertension, as excess adiposity can lead to insulin resistance, dyslipidemia, and chronic inflammation, all of which contribute to the development of these conditions. Therefore, interventions aimed at promoting healthy weight management should be a key component of comprehensive care for individuals with T2DM and hypertension. Strategies to address obesity may include dietary modifications, increased physical activity, behavioral counseling, and, in some cases, pharmacotherapy or bariatric surgery.

The data regarding diabetes history provide valuable insights into the prevalence, duration, and management of T2DM among the study participants. A substantial majority of participants had type 2 diabetes, consistent with global trends that show T2DM as the most prevalent form of diabetes worldwide. Additionally, nearly half of the participants had been living with diabetes for 1-5 years, indicating that many individuals in this population are in the early stages of their diabetic journey.

The high prevalence of T2DM underscores the urgent need for effective management strategies to prevent complications and improve outcomes for affected individuals. It is essential to focus on early detection, regular monitoring, and comprehensive care that addresses not only glycemic control but also cardiovascular risk factors such as hypertension. Multifaceted interventions that target lifestyle modifications, medication adherence, and patient education are critical for optimizing diabetes management and reducing the burden of disease in this population.

The co-occurrence of high blood pressure in over half of the participants further emphasizes the close relationship between T2DM and hypertension. Both conditions share common risk factors, including obesity, physical inactivity, unhealthy dietary habits, and genetic predisposition. Additionally, the presence of hypertension complicates the management of diabetes and increases the risk of cardiovascular complications, renal disease, and mortality. Therefore, integrated care approaches that address multiple health concerns simultaneously are essential for improving outcomes and quality of life for individuals with T2DM and hypertension. The classification of hypertension levels according to the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-8) criteria revealed a concerning prevalence of elevated blood pressure among the study population. More than half of the participants had either prehypertension or hypertension, with a significant proportion falling into the moderate to severe hypertension categories. These findings are consistent with epidemiological data that show a high burden of hypertension in Bangladesh, particularly among individuals with T2DM. The coexistence of T2DM and hypertension poses significant challenges for healthcare providers in terms of risk assessment, treatment selection, and long-term management. Individuals with both conditions are at increased risk of cardiovascular events, renal complications, and mortality, highlighting the importance of aggressive blood pressure control in this population.

Conclusion

In conclusion, the results of this study highlight the complex interplay between socio-demographic factors, anthropometric measures, diabetes history, and hypertension levels among individuals with T2DM in Dhaka City, Bangladesh. The high prevalence of obesity, type 2 diabetes, and hypertension underscores the urgent need for comprehensive and integrated healthcare strategies that address the multifactorial nature of these conditions.

Efforts to promote healthy lifestyle behaviors, improve access to healthcare services, and enhance patient education and empowerment are crucial in mitigating the burden of T2DM and hypertension in Bangladesh. Multidisciplinary approaches that involve collaboration between healthcare providers, policymakers, and community stakeholders are essential for achieving meaningful improvements in population health outcomes and reducing the morbidity and mortality associated with these chronic conditions.

Recommendation

Recommendations for addressing the prevalence of hypertension among type 2 diabetes mellitus (T2DM) patients in Dhaka City include implementing integrated care models, conducting regular screening programs, and promoting lifestyle modifications. Patient education and empowerment initiatives are crucial for enhancing self-management skills, while ensuring access to affordable healthcare services is essential for equitable care. Advocating for health policy changes, supporting research efforts, and fostering community engagement are also vital. Capacity building for healthcare providers and robust monitoring and evaluation systems will further enhance the effectiveness of interventions. By implementing these recommendations, stakeholders can work together to mitigate the burden of T2DM and hypertension, ultimately improving the health outcomes of affected individuals in Dhaka City.

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Appendix – 1

Questionnaire (English) Title

Prevalence of HTN among the Type 2 DM patients In Dhaka City

Date:

.....

Participant Name: ……

Address : ……

Mobile No: ……

Table 1: Socio-demographic characteristics of the study participants.

No	Question	Answer
1	What is your Age?	
2	Gender 1.Male 2.Female 3.Others	
3	What is your academic qualification? a. SSC b. HSC c. Graduate d. Others	

4	What is your marital status? 1. Married 2. Unmarried 3. Divorce 4. Separate	
5	Where do you live? a. Rural b. Urban c. Village	

6	What is your religion? a. Islam b. Hindu c. Christian d. Buddhist e. Others	
7	What is your average monthly income? …….	
8	What is your average working hours per day?	
9	What is your Occupation? a. Farmer b. Self-employee c. Retired d. Merchant	

Part B: Anthropometrics		
No	Question	Anwser
1	What is your height?	
2	What is your weight?	

3	What is your BMI a. Below 18.5 b. 18.5 – 24.9 c. 25.0 – 29.9 d. 30.0 and Above	

Part C: Diabetes related questions		
Diabetes history		
No	Question	Answer
1	How long have you had diabetes or year diagnosed?	
2	What type of diabetes do you have? a. Type-1 b. Type-2 c. Gestational d. Don't know	
Co-morbidities		
No	Questions	Answer
	Have you ever been diagnosed, ever been told, or have you had problems with the following? a. High Blood pressure b. Heart disease c. Kidney problems d. Obesity	

Part D: Hypertension level measurement by JNC -8 Criteria Classification

Classification	Systolic blood pressure (mmHg)		Diastolic blood pressure (mmHg)
Normal	< 120	And	< 80
Prehypertension	120-139	Or	80-89
HTN stage- I	140-159	Or	90-99
HTN stage –II	≥ 160	Or	≥ 100

Appendix – 2

প্রশ্ন পত্র (বাংলা)

নমুনা-২ বহুমূত্র রোগিদের মধ্যে উচ্চরক্তচাপ এর প্রাদুর্ভাব ।

আইডি নাম্বার :

তারিখ:

অংশগ্রহণকারীর নাম:

ঠিকানা:

মোবাইল নাম্বার:

পার্ট-এ: সামাজিক-জনতাত্ত্বিকতথ্য		
প্রশ্ন নাম্বার	প্রশ্ন	উত্তর
১	আপনার বয়স কত?	
২	লিঙ্গ ১। পুরুষ ২। নারী	
৩	আপনার শিক্ষাগত যোগ্যতা কি? ১। এস.এস.সি ২। এইচ.এস.সি ৩। গ্র্যাজুয়েট ৪। অন্যান্য	
৪	আপনার বৈবাহিক অবস্থা কি? ১। বিবাহিত ২। অবিবাহিত ৩। তালাক ৪। আলাদা ৫। অন্যান্য	
৫	আপনি কোথায় বাস করেন? ১। গ্রামীণ ২। উপশহর ৩। শহর	

৯	আপনার ধর্ম কি? ১ : ইসলাম ২ : হিন্দু ৩ : খ্রিষ্টান ৪ : বৌদ্ধ ৫ : অন্যান্য	
১০	আপনার পড়ে মাসিক আয় কত?	
১১	প্রতিদিন আপনার পড়ে কয়েক ঘন্টা কাজ?	
১২	আপনার পেশা কি? ১ কৃষক ২ গৃহিণী ৩ ব্যবসায়ী ৪ চাকরীজীবী	

পার্ট বি: ডায়াবেটিস পরীক্ষা		
নং	প্রশ্ন	উত্তর
1	আপনার উচ্চতা কত?	
2	আপনার ওজন কত?	
3	আপনার বি,এম,আই কত? ১. ১৮ এর নিচে ২. ১৮.৫-২৪.৯ ৩. ২৫.০-২৯.৯ ৪. ৩০ এবং তার উপরে	

পার্ট সি: ডায়াবেটিস সংক্রান্ত প্রশ্ন		
ডায়াবেটিস এর ইতিহাস		
নং	প্রশ্ন	উত্তর
১.	আপনার কতদিন ধরে ডায়াবেটিস হয়েছে বা বছর নির্ণয় হয়েছে?	

২.	আপনার কি ধরনের ডায়াবেটিস আছে? ১. ধরন -১ ২. টাইপ-২ ৩. গর্ভকালীন ৪. জানি না	

সহ-অসুস্থতা		
নং	প্রশ্ন	উত্তর
	আপনাকে কি কখনও বলা হয়েছে, কখনও বলা হয়েছে, বা আপনার নিম্নলিখিত সমস্যা আছে? ১. উচ্চ রক্তচাপ ২. অসাড়তা ৩. কিডনির সমস্যা ৪. দুর্বলতা	

পার্ট-ডি: জেএলসি-৮ অনলাইন রেগিস্ট্রিভিত্তিক ডায়াবেটিস এবং উচ্চ রক্তচাপ এর জন্য পরিমাপ

রেগিস্ট্রিভিত্তিক	হৃদ-সংকোচন-সংক্রান্ত		ডায়াস্টোলিক ব্লাডপ্রেসার
সাধারন	< ১২০	এবং	< ৮০
প্রাক উচ্চরক্তচাপ	১২০-১৩৯	অথবা	৮০-৮৯
উচ্চরক্তচাপ পর্ব-১	১৪০-১৫৯	অথবা	৯০-৯৯
উচ্চরক্তচাপ পর্ব-২	≥ ১৬০	অথবা	≥ ১০০

Appendix – 3

অনুমতি পত্র

আসসালামু আলাইকুম/আদাব,

আমি ; আমি আমার বি.এস.সি এর জন্য এই থিসিসটি পরিচালনা করছি। এর দ্বারা "শিরোনাম" শিরোনামের ফিজিওথেরাপি প্রোগ্রামে আমি **ঢাকা শহরের নমুনা-২ বহুমূত্র রোগিদের মধ্যে উচ্চরক্তচাপ এর প্রাদুর্ভাব দেখতে চাই।** এখন আমি সামাজিক-জনসংখ্যা এবং উচ্চরক্তচাপ সম্পর্কিত প্রশ্ন জিজ্ঞাসা করতে চাই। এটি প্রায় ১৫-২০ মিনিট সময় নেবে।

আমি আপনাকে জানাতে চাই যে এটি একটি সম্পূর্ণরূপে একাডেমিক অধ্যয়ন এবং অন্য কোন উদ্দেশ্যে ব্যবহার করা হবে না। গবেষণায় আপনার অংশগ্রহণ আপনার কর্মজীবনে বর্তমান বা ভবিষ্যতের উপর কোনো প্রভাব ফেলবে না। আপনার দ্বারা প্রদত্ত সমস্ত তথ্য গোপনীয় হিসাবে বিবেচিত হবে এবং কোনও প্রতিবেদন বা প্রকাশের ক্ষেত্রে এটি নিশ্চিত করা হবে যে তথ্যের উৎসটি গোপন থাকবে।এই গবেষণায় আপনার অংশগ্রহণ স্বেচ্ছাসেবী এবং আপনি কোনো নেতিবাচক প্রশ্ন ছাড়াই এই গবেষণা চলাকালীন যেকোনো সময় নিজেকে প্রত্যাহার করতে পারেন। সাক্ষাৎকারের সময় আপনি পছন্দ করেন না বা উত্তর দিতে চান না এমন একটি নির্দিষ্ট প্রশ্নের উত্তর না দেওয়ার অধিকারও আপনার রয়েছে।

অধ্যয়ন বা অংশগ্রহণকারী হিসাবে আপনার অধিকার সম্পর্কে আপনার কোন প্রশ্ন থাকলে, আপনি আমার সাথে যোগাযোগ করতে পারেন এবং/অথবা আমার গবেষণা সুপারভাইজার, জাহিদ বিন সুলতান নাহিদ, সহকারী অধ্যাপক, ফিজিওথেরাপি বিভাগ, সাইক কলেজ অফ মেডিকেল সায়েন্স অ্যান্ড টেকনোলজি, মিরপুর-১৪, ঢাকা -১২১৬।

তাহলে, ইন্টারভিউ নিয়ে এগিয়ে যেতে আমি কি আপনার সম্মতি পেতে পারি?

হ্যাঁ Δ না Δ

অংশগ্রহণকারীর স্বাক্ষর এবং তারিখ .....

সাক্ষাৎকার গ্রহণকারীর স্বাক্ষর এবং তারিখ .....

ফিজিওথেরাপিস্টের স্বাক্ষর এবং তারিখ .....

Appendix – 4

Consent Form (English)

Assalamu Alaikum/ Adab,

I am ; I am conducting this thesis for my B.Sc. In Physiotherapy program titled "Title" by this I would like to **Prevalence of HTN in Types 2 Diabetes mellitus.** Now I want to ask about socio-demographic and hypertension related questions. This will take approximately 15-20 minutes.

I would like to inform you that this is a purely academic study and will not be used for any other purpose. Your participation in the research will have no impact on your present or future in your career. All information provided by you will be treated as confidential and in the event of any report or publication it will be ensured that the source of information remains secret.

Yours participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative questions. You also have the right not to answer a particular question that you don't like or do not want to answer during interview.

If you have any query about the study or your right as a participant, you may contact with me and/or my research supervisor, Zahid Bin Sultan Nahid, Assistant professor, Department of physiotherapy, Saic College of Medical Science and Technology, Mirpur-14, Dhaka-1216.

So, may I have your consent to proceed with the interview?

Yes Δ No Δ

Signature and date of the Participant .....

Signature and date of the Interviewer .....

Signature and date of the Physiotherapist .....

Appendix – 5

SCMST-BPT/IRB/.05.23/019

To
Md. Shohrab Uddin
4th Year Student of B.Sc. in Physiotherapy
Session: ,2016-17 Reg No: 7467
SAIC College of Medical Science &Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Subject: Approval of the thesis proposal **"Prevalence of Hypertension Among the type 2 Diabetic Mellitus Patients in Dhaka City"** by ethics committee.

Dear Md. Shohrab Uddin
Congratulations.
The Institutional Review Board (IRB) of SCMST has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

The purpose of the study is to determine the prevalence of hypertension among the type 2 diabetic mellitus patients in Dhaka City. The study involves face to face interview by using semi-structured questionnaire to determine prevalence of hypertension among the type 2 diabetic mellitus patients in Dhaka City that may take 20 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants.The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 1st November 2023 at SCMST.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring during the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

16. 05. 24

Dr. Abul Kasem Mohammad Enamul Haque
Principal, SCMST&Chairman, Institutional Review Board (IRB)
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Appendix – 6

Grand Chart

Activities/ Month	July 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	App 24	May 24	Jun 24
Proposal Presentation												
Introduction												
Literature Review												
Methodology												
Data collection												
Data Analysis												
Result												
1st progress presentation												
Discussion												
Conclusion and Recommendation												
2nd progress presentation												
Communication with supervision												
Final Submission												