

The Social Determinants of Health Related to the Increased Prevalence and Risk of Diabetes Among South Asians in Canada

by

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PROJECT REVIEW INFORMATION

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Electronic submission of this Major Research Project took place on November 4th, to the following project review committee:

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The above committee determined that the Major Research Project is acceptable in form and content and that the candidate upon submission demonstrated satisfactory knowledge of the field covered by the research paper. A signed copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

There continues to be a high prevalence and risk for diabetes, especially type 2 diabetes (T2D) among South Asians in Canada compared to the general population. Majority of current research continues to take biomedical and behavioural approaches to understanding diabetes among South Asians. These approaches overlook the significance of how living and working conditions, referred to as the social determinants of health (SDH), influence diabetes risk, as well as the overall management of diabetes among South Asians. Therefore, this major project explores the most significant SDH related to the increased prevalence and risk of diabetes among South Asians in Canada.

KEYWORDS:

Culture; Diabetes among South Asians; Gender; Migration; Social Determinants of Health

AUTHOR'S DECLARATION

I hereby declare that this project consists of original work of which I have authored. This is a true copy of the work, including any required final revisions, as accepted by my committee.

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LIST OF ABBREVIATIONS

BDC – Business Development Bank of Canada

BDHS – Bangladesh Demographic Health Survey

BMI – Body Mass Index

CARRS – Cardiometabolic Risk Reduction in South Asia

CCHS – Canadian Community Health Survey

CDC – Centers for Disease Control and Prevention

CVD – Cardiovascular Disease

MASALA – The Mediators of Atherosclerosis in South Asians Living in America

NFHS – National Family Health Survey

OECD – Organization for Economic Cooperation and Development

OR – Odds Ratio

PHAC – Public Health Agency of Canada

PHC – Primary Health Care

RCT – Randomized Control Trial

RRR- Relative Risk Ratio

SDH – Social Determinants of Health

SES – Socioeconomic Status

T2D – Type 2 Diabetes

UK – United Kingdom

US – United States

WHO – World Health Organization

Chapter 1 – Introduction and Background

1.1 South Asians and Diabetes

The prevalence of diabetes in Canada has increased drastically. In the year 2000, approximately 1.3 million Canadians were living with diabetes in Canada (Doucet & Beatty, 2010). However, as of January 2021, 3.888 million people are living with diabetes in Canada (Diabetes Canada, 2021). Given the rapidly increasing incidence and prevalence of diabetes, diabetes has become one of the top health priorities in Canada (Bilandzic & Rosella, 2017). Diabetes is a chronic health condition in which the body does not properly process food for use as energy. Diabetes occurs when the body has either a decreased secretion of insulin due to the inability of the pancreas to produce insulin or impaired body cells that do not recognize insulin signals or action (Centers for Disease Control and Prevention (CDC), 2020). This chronic disease has been found to be widespread especially among South Asian populations in Canada. In fact, South Asians have one of the highest prevalence rates of diabetes and are at most risk for developing diabetes than the general Canadian population (Polsky et al., 2014). In 2021, the prevalence rate of diabetes was found to be 8.5% in South Asian communities – the highest among other visible minority groups and Caucasian populations in Canada (Diabetes Canada, 2021). Due to this increased prevalence of diabetes and the rapid rate by which South Asians are at risk of diabetes and its complications in Canada, an investigation into the factors that are related to this burden of diabetes is needed.

South Asians are an ethnic group originating from the Indian subcontinent, comprising of India, Pakistan, Sri Lanka, Nepal, and Bangladesh (Islam et al., 2014). In Canada, South Asians remain as one of the fastest-growing immigrant populations and the largest visible minority group (Statistics Canada, 2018). In fact, Canada's most recent census from 2016, shows that 1,963,330 million South Asians are living in Canada (Statistics Canada, 2016). By 2031, there is an expectation that this number will increase to 3.6 million South Asians (Statistics Canada, 2016). In addition to being the largest visible minority group in Canada, South Asians also have one of the highest prevalence rates of type 2 diabetes (T2D) than the general population (Sohal, 2008). Furthermore, South Asians are three to five times more likely to develop or live with diabetes than the Caucasian population. In the last decade, the incidence of diabetes among South Asians in Canada has only increased with many cases remaining undiagnosed and or poorly managed (Sohal, 2008). This increased prevalence and risk of diabetes is seen in South

Asians who have migrated to Western countries as well as South Asians living in rural and urban parts of South Asia (Mitra & Janjua, 2012).

1.2 Biological and Behavioural Causes of Diabetes and South Asians

Studies examining the reasons why South Asians have an increased prevalence and risk for diabetes, specifically T2D, are ongoing. However, much of the existing evidence attributes the higher rates of diabetes among South Asians to metabolic/biological and behavioural risk factors (Gujral et al., 2013; Misra et al., 2014; Narayan & Kanaya, 2020). This focus highlights a continued emphasis of the dominant biomedical and behavioural model of health.

In the biomedical model of health, illness and the underlying symptoms are assumed to be the result of an abnormality in the body in which the patient is viewed as a passive recipient of treatment through medications and other medical interventions (Yuill et al., 2010). Thus, from a biomedical stance, diabetes is a disease in which the individual's body does not produce insulin or is not able to use the produced insulin properly due to physiological causes (Diabetes Canada, 2020). According to several researchers, the increased prevalence of T2D among South Asians is the result of their increased BMI and abdominal/visceral fat, increased level of fatty acids, insulin resistance, and metabolic syndromes compared to the Caucasian population (Gujral et al., 2013; Misra et al., 2014; Narayan & Kanaya, 2020). An argument is also presented that the phenotype of South Asians makes them more susceptible to T2D than other populations because of fetal programming, insulin resistance, pancreatic beta cell capacity, and capacity for fat storage (Gujral et al., 2013; Unnikrishnan et al., 2018).

On the other hand, a behavioural approach conceives the health status of an individual as shaped largely by an individual's health behavioural choices and actions that may lead to an increased risk for diabetes, such as eating habits and physical activity levels (Laverack, 2017). Numerous researchers argue that South Asians are more likely to be physically inactive and consume high-caloric and carbohydrate meals (Gujral et al., 2013; Misra et al., 2014; Shah & Kanaya, 2014). The adoption of high-caloric and carbohydrate diets is thought to be because the South Asian everyday traditional diet consists of mainly starchy foods such as sweets, rice, and curries in comparison to the European diet that is comprised of less calories and carbohydrates overall (Gujral et al., 2013; Misra et al., 2014; Patel et al., 2021; Shah & Kanaya, 2014). Furthermore, physical inactivity as well as the consumption of unhealthy diets are thought to be

to be the result of South Asians migrating to Western nations where they develop a more sedentary lifestyle coupled with eating high-carbohydrate and fatty food items. Thus, under the behavioural model of health, lifestyle behaviours are viewed as contributing to insulin resistance and T2D among South Asians (Gujral et al., 2013; Misra et al., 2014; Shah & Kanaya, 2014).

As a result of the dominance of biological and behavioural approaches to explaining diabetes, existing interventions and management strategies for diabetics can be divided into two categories (Glazier et al., 2006). First, medication management refers to the use of medications to control sugar levels or insulin injections to ensure sufficient insulin (Glazier et al., 2006). Second, lifestyle management which includes diabetes education, good nutrition, physical activity, weight management and monitoring (Glazier et al., 2006; Lambrinou et al., 2019). Despite these well-known interventions and management strategies, the prevalence of diabetes and the risk for developing diabetes continues to be high among the South Asian population in Canada. Therefore, the question becomes why is diabetes still so prevalent among South Asian populations in Canada given that scientifically sound interventions and management strategies have been developed for diabetes?

A vast majority of the literature on diabetes assumes that individuals diagnosed with diabetes choose to engage in unhealthy habits such as poor diet and physical inactivity that increase their BMI, levels of visceral fat, and sugar levels (Raphael et al., 2003). Placing blame and responsibility for illness on the individual is not sufficient action or a solution. For example, Sohal (2008) states that South Asians have poor compliance rates with lifestyle changes in diet, weight control, and physical activity. Several researchers in addition to Sohal (2008), argue that this poor compliance is because South Asians are accustomed to eating foods cooked in large amounts of oil and ghee as well as consuming large quantities of sweets as a part of their diet (Morrison et al., 2014; Singh et al., 2012). But these researchers overlook the fact that decisions around food and eating habits as well as physical activity are dependent on economic, social, political, and cultural factors referred to as the “social determinants of health” (SDH) (Raphael, 2016). Therefore, the continued high prevalence and risk of diabetes among South Asians can be better understood and reduced through research that highlights the non-biomedical factors that lead to the inability of South Asians to adopt nutritious and healthy diets as well as engage in physical activity/exercise. Biological/behavioural risk factors and genetic composition alone do not predispose South Asians to diabetes or T2D. SDH play a role in diabetes occurrence and

progression among South Asians but is not given as much importance due to the predominance of biomedical and behavioral approaches (Raphael, 2016). Therefore, the SDH approach will be used in this major project.

In sections 1.3 and 1.4 below, an overview of the consequences (i.e., costs) of diabetes on health care systems, the economy, and individuals will be provided. A discussion of the short-term and long-term health complications of diabetes for individuals will also be added as it will provide the reader with a better understanding of the harmful effects of diabetes on Canada's health care system, economy, and among individuals more broadly. In addition, it will allow the reader to understand why immediate efforts are needed using a SDH approach as opposed to a biomedical/behavioural approach to address the diabetes burden among South Asians in Canada.

1.3 Costs of Diabetes on the Health Care System

Diabetes places significant constraints on Canada's economy and the health care system, approximately costing \$3.1 billion in 2020 based on 3.7 million prevalent cases predicted using a diabetes cost model (Bilandzic & Rosella, 2017). By 2040, it is expected that there will be about 642 million individuals living with diabetes globally (Ogurtsova et al., 2017). The costs resulting from diabetes will continue to grow as the prevalence of the disease increases.

The economic costs of diabetes can be divided into direct and indirect costs (Doucet & Beatty, 2010). Direct costs are associated with health care paid for by public or private health insurance or by individuals and their families. These costs include hospitalizations, medications, physician, and emergency room visits, and out-of-pocket costs for diabetes supplies and treatment (Government of Canada, 2011). In Canada, the total direct health care costs of diabetes in 2021 was reported to be \$3.958 billion for the primary management of diabetes (Diabetes Canada, 2021). For individuals paying out of pocket, Diabetes Canada (2021) estimated an average of \$1,200 to \$1,900 for direct annual out-of-pocket expenses for T2D oral medication and \$1,100 to \$2,600 for type 1 diabetes insulin injections in 2021. These out-of-pocket expenses for diabetes medications, devices, and supplies represent more than 3% of the annual income of an average individual (Diabetes Canada, 2020).

Contrarily, indirect costs are the non-healthcare costs that impact the economy and individuals as a direct result of sickness, disability, or premature death (Government of Canada, 2011). By 2025, it is estimated that \$228 million will make up the indirect costs associated with

diabetes in Canada. This is expected to increase within the next decade in which the costs of diabetes associated with lost productivity and missed work are expected to be approximately \$14 billion per annum (Diabetes Canada, 2017).

According to Diabetes Canada (2020), if the prevalence of diabetes in Canada grows by 40% in the next decade, the health care costs associated with treating people with diabetes in Canada will top more than \$39 billion by 2028. One of the most affected populations by diabetes in terms of prevalence and incidence is South Asian communities in Canada (Sohal, 2008). Given the economic burdens that diabetes has on the health care system, the economy as well as individuals, it is important to address the root causes of diabetes among South Asians in a timely manner, to reduce these economic burdens associated with diabetes among South Asians.

1.4 Health Complications Associated with Diabetes

In addition to the economic burden of diabetes, there are also short-term and long-term health complications associated with diabetes which are harmful to the health of individuals and can be prevented. The common short-term health complications associated with diabetes include infection, slow wound healing, falls, loss of consciousness, and diabetic ketoacidosis (Public Health Agency of Canada (PHAC), 2011; World Health Organization (WHO), 2020).

Diabetes can also result in long-term health complications such as hyperglycemia (high blood sugar) which impairs the metabolism of carbohydrates, fats, proteins, and electrolytes as well as retinopathy (blindness), nephropathy (kidney disease), and nerve damage (neuropathy) (PHAC, 2011). Evidence shows that 25.1% of retinopathy (blindness) is caused by diabetes in Canada (Diabetes Canada, 2020). In addition, diabetes can also cause cardiovascular and cerebrovascular disease. In Canada, people living with diabetes are 3 times more likely to be hospitalized due to cardiovascular disease. This includes coronary artery disease, myocardial infarction, and stroke (Huang et al., 2017). In 2019 alone, diabetes contributed to 30% of strokes, 40% of heart attacks, and 50% of kidney failure requiring dialysis (Diabetes Canada, 2019). Other long-term complications of diabetes include hypertension, and obesity (Lotfy et al., 2016).

Overall, diabetes complications, both short and long-term, are associated with premature death, reducing the lifespan of individuals by 5 to 15 years (Diabetes Canada, 2020). Therefore, with the growing prevalence of diabetes among South Asians and the severe health complications, both short and long-term, associated with diabetes, it is important to take a more

comprehensive approach to understand diabetes and explore the SDH related to the high prevalence and increased risk of diabetes among South Asians. I have seen my own family members diagnosed with diabetes suffer from complications such as a stroke in which they became permanently paralyzed. This affected their ability to work and provide an income for their family but also reduced their overall quality of life due to the personal, social, and economic burdens of diabetes and its complications.

As previously mentioned, this major project will utilize the SDH framework, including a description of the history of SDH and a definition of SDH. The reader will get a good understanding of how and why the SDH approach came into existence, especially in Canada and elaborate on what the SDH approach is about. Furthermore, the reader will understand why the SDH framework is useful in explaining the high prevalence and risk of diabetes among South Asians in Canada to reduce the burdens that it can cause.

1.5 Social Determinants of Health

1.5.1 – History of the Social Determinants of Health

By the mid-1960s, it was clear around the world that the dominant medical and public health models were not meeting the needs of certain disadvantaged groups due to poverty and avoidance of the effects of living and working conditions of individuals (Braveman & Gottlieb, 2014). Thomas McKeown, a Scottish physician illustrated the limits of medical care by examining death rates in England and Wales from the mid-19th century through the early 1960s. He found that mortality rates from multiple causes had fallen steadily even before the availability of modern medicine and treatment such as antibiotics and intensive care units. McKeown identified that the dramatic increases in life expectancy were related to improved living conditions, including nutrition, sanitation, and clean water. Though advances in medical care may have contributed, many researchers believed that nonmedical factors were more important (Braveman & Gottlieb, 2014).

The 1978 Alma-Ata Conference and Declaration was a major milestone that expressed the urgent need for international governments, policymakers, international organizations, as well as health and development workers to protect and promote the health of all people through implementing primary health care (PHC) throughout the world and in developing countries (Hixon & Maskarinec, 2008). PHC is the first point of contact of individuals, the family, and the

community with the national health care system and includes all the services that play a part in health such as income, housing, education, and the environment (Government of Canada, 2012; Hixon & Maskarinec, 2008). According to the Alma-Ata Declaration, economic and social development were prerequisites for the attainment of health for all and successful PHC. Thus, the declaration pushed for a health system model that considered the underlying social, economic, and political causes of ill-health while promoting the economic and social sectors to be involved with the health sector. This emphasis on the importance of the social, economic, and political context to PHC's success played a role in the development of the SDH (Hixon & Maskarinec, 2008).

The SDH approach in Canada emerged through the contributions made by the 1974 Lalonde Report. The report which is formally known as *A New Perspective on the Health of Canadians* was the first government document in the Western world to propose a comprehensive framework for understanding health determinants and to acknowledge the limited role of health care in improving health (Lucyk, 2018; Raphael, 2016). The Lalonde Report identified biology, environment, lifestyle, and health care organizations as the four main determinants of health. Though the Lalonde report outlined determinants of health outside of the health care system, it mostly took a behavioural approach to disease in which individual responsibility for the disease was a common theme (Raphael, 2016).

It was only in 1986 that a greater emphasis on the key determinants of health-driven by the federal report, *Achieving Health for All: A Framework for Health Promotion* occurred (Raphael, 2016). This document outlined reducing inequities in health between income groups as an important goal of government policy. Later, in Health Canada's (1998) *Taking Action on Population Health: A Position Paper for Health Promotion and Programs Branch Staff*, there was even more evidence indicating that factors outside the health care system affected health; including income, education, working conditions, employment, social environments, physical environments, biology, genetics endowment, healthy child development, health services, gender, and culture. Since 1998, several documents and reports have been published on these concepts. However, according to Dennis Raphael (2016), a current professor at York University, there has been little diffusion of SDH into Canadian public policymaking due to the dominance of the biomedical and behavioural models of health.

1.5.2 – Definition of Social Determinants of Health

The WHO's Commission on the SDH defines SDH as “the conditions in which people are born, grow, live, work and age” and the “fundamental drivers of these conditions” (Braveman & Gottlieb, 2014, p.19). These circumstances are affected by the distribution of money, power, and resources at the global, national, and local levels (Magnan, 2017). Therefore, the term SDH refers to the economic and social conditions that shape the health of individuals, communities, and populations (Raphael, 2016). According to Raphael (2016) the 16 SDH that are the most relevant to Canadians include: indigenous ancestry, disability, early life, education, employment and working conditions, food security, gender, geography, health care services, housing, immigrant status, income and its distribution, race, social safety net, social exclusion, unemployment, and employment security. These SDH determine whether individuals stay healthy or become ill. SDH also determines the extent to which a person possesses the physical, social, and personal resources to satisfy their needs, cope with the environment and achieve personal goals. Therefore, SDH are about the quantity and quality of resources that a society makes available to its members. These resources can include but are not limited to, childhood conditions; access to income and employment; education and literacy; food, housing, and working conditions; and health and social services (Raphael, 2016).

Overall, the study of SDH according to Raphael (2016) involves three key aspects: 1) societal factors (i.e., income, education, employment conditions, etc.) that shape health and explain health inequalities, 2) societal forces (i.e., economic, social, political) that shape the quality and distribution of these factors and 3) economic and political systems that make addressing the SDH through public policy difficult. The utilization of the SDH approach in this major project will allow for an understanding of how the living and working conditions of South Asians as well as the distribution of these factors which is shaped by the social, economic, and political environment can lead to diabetes and affect its management. This is important as the incidence and prevalence rates of diabetes among South Asians in Canada continue to remain high compared to Caucasians despite existing interventions and programs that target diabetes.

Below in section 1.6, the motivations for this major project will be discussed.

1.6 Rationale of the Major Project

The impetus for this major project on diabetes among South Asians came from my personal experiences as a first-generation child of South Asian immigrant parents. Being South Asian, I have had exposure to the difficulties of preventing and managing diabetes through the experiences of my parents and relatives. There are scientifically sound medications to manage diabetes as well as diet and exercise guidelines provided by health care providers and health organizations to prevent and manage diabetes. Furthermore, there are also weight loss programs targeted towards diabetics to assist in diabetes management for the general population. However, given all these solutions, I have always been aware that South Asians face a high burden of diabetes compared to the rest of the population in Canada.

From familial experiences and hearing the stories of other South Asians in my community, I am aware that diabetes risk and the adoption of a healthy diet and engaging in physical activity is dependent on factors such as socioeconomic status and cultural habits termed as the SDH. In fact, my parents as well as their siblings did not complete high school and came to Canada as immigrants to start a whole new life and needed to work long hours to provide for their family. As a result, they had very little time to engage in physical activity and could only purchase food that was affordable to them. It was only a matter of time when the accumulation of little physical activity and high-fat diets led to diabetes. Growing up and seeing how the living and working conditions of my family members affected their health led me to understand that diabetes is influenced by external risk factors. However, a vast majority of the literature on diabetes among South Asians overlooks SDH that influence diabetes outcomes and management. Given this, I think that it is important for research to explore how the inability to participate in a healthy lifestyle or modify one's lifestyle as recommended for diabetic South Asians is influenced by income and household wealth, education, migrational status, culture, gender, housing, and access to health services among several other factors. Using the SDH approach can lead to structural level changes such as affordable nutritious foods, improved working conditions, more recreational spaces, and culturally appropriate diabetes education programs, and management strategies. These health care and social changes can help to tackle the diabetes burden on South Asians.

The development of this major project is to highlight that the current explanations for diabetes among South Asians need to be further explored. The dominant biomedical and

behavioural models of health are not entirely sufficient to tackle diabetes among the South Asian population. In this paper, I aim to demonstrate that the primary reason that South Asians have an increased prevalence and risk of diabetes compared to others in the Canadian population is because of their everyday living and working conditions. In other words, SDH influence the health of South Asians and their ability to prevent and or manage diabetes.

Keeping in mind the growing personal, social, and economic burdens of diabetes for South Asian individuals, communities as well as the larger health care system and economy, a literature review will be performed utilizing a SDH lens to explore the high prevalence of diabetes among South Asians. My research question is: “*What are the social determinants of health that are related to the high prevalence and risk for diabetes among South Asians in Canada?*” The focus will be on identifying the root causes of diabetes among South Asians, beyond dominant biomedical and behavioural risk factors, so that recommendations for research, policy, as well as health care and practice can be made in the conclusion of this major project to contribute to the reduction of the diabetes burden among South Asians in Canada.

The next chapter will include a literature review on the key SDH that have been identified to be related to the increased prevalence and risk of diabetes among South Asians and will underline the relevant evidence to the aforementioned research question.

Chapter 2- Literature Review

This chapter will begin with a brief explanation of the search and selection criteria utilized for the literature review that investigates the SDH related to the increased prevalence and risk of diabetes among South Asians. This will then lead to the analysis of the relevant articles which were investigated through multiple themes (i.e., socioeconomic status (SES), migration, preserving culture through food, and gender). The literature review will then lead to the discussion of the gaps identified related to diabetes prevalence and risk among South Asians. This analysis will demonstrate the importance and need for utilizing a SDH approach to tackle diabetes among South Asians in Canada.

2.1 Search and Selection Criteria

The databases that were used to gather all relevant peer-reviewed literature on diabetes risk, prevention, and management among South Asian adults and the influence of social determinants of health included “CINAHL”, “Pubmed”, “Medline” and the “Ontario Tech U” library database. The search terms used within all databases were:

- (South Asian/s OR Indian/s OR South Asia*) AND (Diabetes OR Diabetes Mellitus OR Prediabetes OR Glucose Intolerance)
- (Social determinant/s of health OR determinants of health) AND Diabetes* AND (South Asian/s OR South Asia*)
- (Socioeconomic status OR Socioeconomic Factors OR Socioeconomic position OR Education OR Income OR Occupation) AND Diabetes AND (South Asian/s OR South Asia*)
- Migration AND Diabetes AND South Asia*
- Culture AND Diabetes AND South Asia*
- Gender AND Diabetes AND South Asia*

The four search engines provided a limited number of articles for the phenomenon under review. However, the reference list of the studies that met the inclusion criteria (see table 1) were then reviewed to select more articles to include in the literature review. This yielded a total of 15 peer-reviewed studies which were relevant for the purpose of this literature review. It is important to note that one study related to CVD among South Asians and SDH was included in the literature review. This article focused primarily on CVD with some discussion of diabetes.

However, the inclusion of this article is because CVD is also a chronic lifestyle disease like diabetes. In fact, diabetes is an independent risk factor for CVD. Thus, this article is helpful especially since the literature that addresses SDH related to diabetes risk, prevention, and management among the South Asian population was limited.

In addition, grey literature was searched to identify further articles to be included in the literature review published by governments and health organizations due to the paucity of scholarly studies that exist on diabetes among South Asians in Canada that utilize a SDH approach. This led to the identification of one Canadian-based report that focused on the relationship between diabetes and various SDH among the general population (Polsky et al., 2014). As well as the identification of one Canadian-based report that discussed the relationship between SES and the overall health of the population (Ingen et al., 2015). Another report that focused on the relationship between SDH and the overall health status of South Asian groups in British Columbia was also retrieved (Fraser Health Authority, 2015). Lastly, one US-based report that focused on the relationship between SES and overall health among the general population was retrieved (Woolf et al., 2015).

Table 1 shows the inclusion and exclusion criteria for the selection of articles for this literature review.

Table 1. Inclusion and exclusion criteria for selecting articles for the literature review.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Peer-reviewed articles/grey literature 	<ul style="list-style-type: none"> • Articles that were not in English
<ul style="list-style-type: none"> • Articles that were published in English 	<ul style="list-style-type: none"> • Studies on prediabetic and diabetic children
<ul style="list-style-type: none"> • The population that was included was South Asian individuals of ages 18 and above, at risk for diabetes and or cardiovascular disease (CVD) • Or South Asians clinically diagnosed as pre-diabetic/diabetic OR had CVD 	<ul style="list-style-type: none"> • Studies related to gestational diabetes.

<ul style="list-style-type: none"> • Studies performed in Canada and across different countries. 	<ul style="list-style-type: none"> • All studies conducted earlier than 2006
<ul style="list-style-type: none"> • Studies that described or examined risk factors for diabetes alone OR in relation to CVD as well as discussed diabetes management were included. 	<ul style="list-style-type: none"> • Studies that addressed biomedical risk factors to diabetes
<ul style="list-style-type: none"> • The studies had to focus on the SDH 	
<ul style="list-style-type: none"> • Years of publication 2006 until 2021 	

Overall, the articles were selected to increase knowledge on the diabetes topic, develop various arguments, and most importantly, construct a literature review that is logical and coherent. The themes and subthemes for this literature review were developed using the 16 SDH outlined by Raphael (2016) which was described earlier in section 1.5.2 of the previous chapter. While reviewing the literature, four major SDH related to the increased prevalence and risk of diabetes among South Asians were identified. These SDH were used as the four major themes of this major project. These themes include 1) SES which was divided into two subthemes (i.e., educational attainment and household wealth), 2) migration, 3) preserving culture through food, and 4) gender.

Sections 2.2 to 2.5 below, will now highlight the relevant articles that address the SDH related to the increased prevalence and risk of diabetes among South Asians.

2.2 Socioeconomic Status and Its Relationship to Diabetes Prevalence and Risk Among South Asians

In this review of literature, SES as a SDH was a recurrent theme across four research studies and shown to have a strong relationship to the increased prevalence and risk of diabetes among South Asians. Since SES is a multidimensional construct and the researchers of each study measured SES through different indicators; this theme was divided into two sub-themes: (a) educational attainment, and (b) household wealth.

a) Educational Attainment

“Educational attainment” was the first sub-theme identified in the review of literature on the SDH (i.e., socioeconomic factors) related to the high prevalence and increased risk of diabetes among South Asians (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012; Shah et al., 2014). The common aim across these studies was to explore whether there was a relationship between the increased prevalence and risk of diabetes among South Asians determined by different correlates such as income and household wealth but also educational attainment (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012; Shah et al., 2014). Most researchers used cross-sectional designs, employing data of large national health surveys in India, Pakistan, or Bangladesh and multi-recruitment sampling strategies (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012). Shah et al. (2014) contrarily performed their cross-sectional study utilizing a community-based cohort of South Asians in the United States (US).

Education, specifically level of education attained, has been shown to influence overall health as it is related to economic and social mediators of health such as income, occupation, and access to health care (Raghupathi & Raghupathi, 2020). Educational attainment determines the material and social resources needed to sustain a healthy lifestyle consisting of nutritious food and physical activity (Raphael, 2016). In the studies by Chowdhury et al., (2015) and Corsi and Subramaniam (2012), educational attainment was categorized into four levels: no education, primary education, secondary education, or higher education. In the study by Ali and his team (2016), education was divided into three categories: up to primary school, high school/secondary schooling, and college graduate and higher. Shah et al. (2014) contrarily divided education into two categories – less than a bachelor’s degree or a bachelor’s degree. These categories from all the studies were developed to reflect low educational attainment or high educational attainment and determine the relationship of varying educational attainment categories to diabetes outcomes in South Asians.

Research shows that in developing countries such as India, Pakistan, and Bangladesh, higher educational attainment is associated with an increased prevalence of diabetes among South Asians (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012). In 2012, Corsi and Subramaniam published a study exploring the relationship between SES and self-reported T2D among South Asians in India. Using data from the 2005 to 2006 National Family

Health Survey (NFHS) in India as well as interviews with the South Asian survey respondents, Corsi and Subramaniam (2012) found that South Asians belonging to the highest socioeconomic groups defined by higher educational attainment had an increased prevalence of self-reported diabetes (1.9% prevalence in higher education groups versus 1.0% in groups that had no education). This was a similar conclusion reached by Chowdhury et al. (2015) in their cross-sectional study utilizing data from the 2011 Bangladesh Demographic Health Survey (BDHS) – another nationally representative survey. Chowdhury et al. (2015) found that South Asians with higher educational attainment were 1.67 times more likely to have diabetes than South Asian respondents with no education. Similarly, Ali et al. (2016) in their cross-sectional study in India and Pakistan using data from the 2011 Centre for Cardiometabolic Risk Reduction in South Asia (CARRS) survey found the prevalence of diabetes to be higher among South Asians that completed graduate education (22.3%) versus those that completed primary or secondary education (18.1% and 22.1%, respectively). The findings of these three studies indicate that the prevalence of diabetes among South Asians in developing countries is the highest among those that completed higher education (i.e., undergraduate, and graduate degrees) equated with higher SES. Although these studies are valuable in illustrating the relationship between SES, specifically, educational attainment, and diabetes prevalence among South Asians in developing countries, the researchers did not explain the reasons why or how SES/educational attainment influences diabetes outcomes among South Asians, which is a significant limitation which will be further explored in the discussion chapter.

In addition to the increased prevalence of diabetes among South Asians being related to higher educational attainment, Chowdhury et al. (2015) and Corsi and Subramaniam (2012) also found an overall increased risk for developing diabetes among South Asians with higher educational attainment. In fact, in both studies, the highly educated South Asian respondents were more likely to report they were at risk for developing diabetes than the non-educated respondents (Chowdhury et al., 2015; Corsi & Subramaniam, 2012). A similar conclusion was made by Ali et al. (2016) who explored ‘risk’ for developing diabetes among South Asians by examining weight-based risk factors and behavioural risk factors. According to Ali et al. (2016), South Asian participants with a higher education (i.e., graduate education or higher) were found to be at greater risk for diabetes and CVD based on weight-related risk factors. For example, the prevalence of being overweight or obese as well as having central obesity (excess abdominal fat)

was 1.5 times more prevalent in higher rather than lower education groups, putting South Asians with higher educational attainment at increased risk for developing diabetes (Ali et al., 2016). According to Ali et al. (2016), this finding can be explained by the fact that individuals with higher educational attainment equated with high SES have greater access to calorie-dense foods and engage in little physical activity which leads to higher weight profiles, increasing their risk for diabetes.

Ali et al. (2016) also investigated behavioural risk factors for diabetes and CVD (i.e., low vegetable and fruit intake) but contrarily found that South Asian participants with lower educational attainment were at increased risk for diabetes. Low fruit and vegetable intake - a risk factor for diabetes, was more prevalent among South Asian groups that had no education or completed primary school as opposed to those that complete graduation school (primary education: 68.0% versus, secondary education: 60.3% versus, graduate education: 48.0%) (Ali et al., 2016). According to Ali et al. (2016), this finding can be explained by the fact that among South Asians with lower educational attainment equated with low SES, corresponding lifestyle behaviours at the individual and household level are argued to be due to quantity of healthy food available (Ali et al., 2016). In other words, South Asians with lower educational attainment may not have access or availability to enough affordable fruits and vegetables; leading to a lower consumption of fruits and vegetables as a whole; thereby, increasing their risk for diabetes.

To conclude, Chowdhury and his team (2015) as well as Corsi and Subramaniam (2012) studied the overall risk for diabetes without attending to different types of risk factors and conclude that the risk for diabetes is higher among highly educated South Asians. However, Ali and his team (2016) based on different types of risk factors (i.e., weight-based risk factors and behavioural risk factors) find variations in diabetes risk across educational attainment categories. Based on weight-related risk factors, diabetes is the highest among South Asians with higher educational attainment. Contrarily, based on diet-related risk factors (fruit and vegetable consumption), diabetes is the highest among South Asians with lower educational attainment. These contrasting findings across the studies are attributable to the difference in how variables of interest were defined and approached in each study.

Given the value of these findings to understanding that diabetes outcomes among South Asians are related to educational attainment, it is important to note that there are some limitations regarding the generalizability of the findings of the aforementioned studies to the Canadian

South Asian population. The studies included a sample of South Asians located within a developing country and explored the experiences of South Asians specific to India, Pakistan, and Bangladesh (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012). The experience of diabetes among South Asians from developed countries such as Canada, the US, the UK, and Europe can be much different from the South Asian population in developing countries. This is due to the different economic and political contexts as well as the different opportunities available to education across developed versus developing countries (Elmawazini et al., 2017). This can create variations in the effect that education may have across populations. Therefore, the findings may not be generalizable to the Canadian population of South Asian diabetics or those at risk of developing diabetes.

In contrast to the research that shows that the high prevalence of diabetes among South Asians is associated with higher educational attainment in developing countries, Shah and her colleagues (2014) in their U.S based cross-sectional study found that there was a higher prevalence of diabetes among South Asians with lower educational attainment. Participants for their study were derived from the Mediators of Atherosclerosis in the South Asians Living in America (MASALA) study. Shah et al. (2014) found that South Asian groups with an educational attainment equivalent to primary school or secondary school had a higher prevalence and risk of diabetes (Relative Risk Ratio (RRR) = 1.79) than those that had attained a bachelor's degree or above (RRR=1.10) (Shah et al., 2014). RRR refers to the probability of an event occurring in one group versus another group (Hoffman, 2021). This means that South Asians in the US that completed primary or secondary education, which was equated with lower educational attainment, were 1.79 times more likely to develop diabetes and have a higher prevalence of diabetes than those that completed post-secondary education which was equated with higher educational attainment (1.10 times likely).

Shah et al's (2014) findings contrast with the studies by Ali et al. (2016), Chowdhury et al. (2015), and Corsi and Subramaniam (2012) in South Asian countries such as India, Pakistan, and Bangladesh. Shah et al. (2014) conclude that the contrasting finding that lower educational attainment is related to the high prevalence of diabetes among South Asians is most likely due to the geographic location of their study. Shah and her team (2014) address that in studies based in developed countries such as the US, UK, Germany, France, and Canada, lower educational attainment is associated with a higher prevalence of diabetes among South Asians. But in

developing countries such as those in South Asia, higher educational attainment is associated with a higher prevalence of diabetes (Shah et al., 2014). Ali et al. (2016), Chowdhury et al. (2015), and Corsi and Subramaniam (2012) conducted their studies in developing countries (India, Pakistan, and Bangladesh) that are less economically developed which impact access to healthy foods. In these developing countries, highly educated South Asians may have better access and availability to high caloric foods in comparison to fresh produce leading to a greater prevalence and risk of T2D among highly educated South Asians due to the increased consumption of unhealthy foods (Ali et al., 2016). This is further supported by the WHO (2020), which found that in developing countries, there is an increased reliance on staple foods which are unhealthy and frequently consumed such as rice and bread as opposed to fruits, vegetables, and animal source foods. This high consumption of staple foods is found to be related to the limited availability of healthier foods and its high costs compared to staple food items which are more affordable and readily available (WHO, 2020). This is not the case in developed countries such as the US and Canada. In developed countries, there are advanced infrastructures in place and stable economic growth (Business Development Bank of Canada (BDC), n.d). Living in a developed country allows for a greater quantity of nutritious and healthy food. Furthermore, there is also better access to healthy foods within proximity to ones living space in comparison to developing countries (WHO, 2020). Lastly, those with higher educational attainment can afford healthy foods despite their high costs in developed countries because they have the financial means to purchase them. Thus, the highly educated South Asians in developed countries can purchase healthier foods due to greater availability and access which can prevent diabetes among them (Ali et al., 2016).

Shah et al.'s (2014) finding that low levels of education increase the prevalence and risk of diabetes among South Asians in developed countries such as the US is supported by the city of Peel's report titled *The Diabetes Atlas for the Region of Peel*. The socioeconomic factors that were explored in this report were gathered from the 2006 Canadian census which is a national survey of the population and agriculture performed every five years and provides high-quality information on key socioeconomic trends (Statistics Canada, 2021). In the report, it was highlighted that in the Region of Peel, diabetes prevalence was the highest among areas that had residents that did not complete high school or had overall lower levels of educational attainment (Polsky et al., 2014). Overall, South Asians may be at increased risk for T2D in Canada due to

lower levels of education compared to other populations in Canada. In a report published by the Fraser Health Authority (2015) in Canada titled *The South Asian Health*, it was found that 53% of the South Asian population in British Columbia reported that their highest level of education was equivalent to high school or less compared to the general population (43%). In developed countries such as Canada, education influences a person's choice of food through greater knowledge of nutrition and its health effects and makes people more receptive to health education messages. It also makes it easier for people to access appropriate health services (Polsky et al., 2014). Furthermore, having a higher education in developed countries, makes it easier to have better-paid employment opportunities as well as higher literacy which allows people to understand health care information and practice good lifestyle habits (Fraser Health Authority, 2015). Thus, educational attainment is a SDH that may explain the increased prevalence and risk of diabetes, specifically T2D among South Asians in Canada. Due to a high percentage of South Asians that have low levels of education in Canada, they are at increased risk for developing diabetes based on lifestyle-related decisions.

b) Household Wealth

“Household Wealth” was the second sub-theme identified in the review of literature on the SDH (i.e., socioeconomic factors) related to the high prevalence and increased risk of diabetes among South Asians (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012). Wealth has been understood to shape living conditions, affect physiological functioning, and influence health-related behaviours such as diet and the extent of physical activity. More specifically, wealth determines the quality of other SDH such as food security, housing, and other basic prerequisites for an overall good health (Mikkonen & Raphael, 2010).

In the studies by Ali et al. (2016), Chowdhury et al. (2015), and Corsi and Subramaniam (2012), wealth was indicated by measuring total household wealth. Household wealth was defined by asset ownership (i.e., ownership of a home, car, computer, mobile phone) and housing characteristics (i.e., type of windows and flooring, water, and sanitation facilities) in the studies by Ali et al. (2016) and Corsi and Subramaniam (2012). Chowdhury et al. (2015) did not define household wealth, which is a notable limitation. Chowdhury et al. (2015) and Corsi and Subramaniam (2012) divided household wealth into fifths from poorest to richest. The poorest household wealth category was representative of households that had the lowest asset ownership

and poor housing characteristics (little to no windows, poor flooring, limited water supply, and poor sanitation) equated with a low SES. Whereas, the richest household wealth category was representative of households with the greatest asset ownership as well as high-quality housing characteristics (more windows, high-quality flooring, adequate water supply and high-quality sanitation) equated with a high SES (Chowdhury et al., 2015; Corsi & Subramaniam, 2012). Contrarily, Ali et al. (2016) divided household wealth into three categories –low, middle, and high. From low to high household wealth, these categories like Chowdhury et al. (2015) and Corsi and Subramaniam (2012) represented households with the least amount of assets and poor housing characteristics (low SES) and households with the greatest amount of assets and high-quality housing characteristics (high SES), respectively.

Most researchers argue that in developing countries such as India, Pakistan, and Bangladesh, South Asians with a higher household wealth have reported an increased prevalence of diabetes (Ali et al., 2016; Chowdhury et al., 2015; Corsi & Subramaniam, 2012). Corsi and Subramaniam (2012) in their cross-sectional study found that the highest socioeconomic groups defined by the richest quintile of household wealth had an increased prevalence of self-reported diabetes (2.5% prevalence in richest versus 0.4% in poorest). In fact, South Asians belonging to the richest household wealth category were 4 times more likely to have diabetes than those from the poorest households (Odds Ratio (OR) = 4.04) (Corsi & Subramaniam, 2012). This was the same conclusion reached by Chowdhury and his team (2015) in their cross-sectional study who found that most South Asian diabetic respondents belonged to the richest households (39.1%), followed by the second richest households (21.4%). Furthermore, according to Ali et al. (2016), in their cross-sectional study, they found that the prevalence of diabetes in low to high household wealth groups was as follows: low household wealth: 18.3% versus, middle household wealth: 21.0% versus, high household wealth: 26.0%.

In summary, in developing countries such as India, Pakistan, and Bangladesh, the richest South Asian groups defined by high household wealth have the highest prevalence of diabetes compared to the rest of the population. Despite this interesting finding, the researchers did not indicate the reasons why or how household wealth influences diabetes prevalence and risk among South Asians. For example, according to a report published in 2015 by the Center on Society and Health - an academic research center at Virginia Commonwealth University, wealth and household wealth determines one's access to healthy food and to green space, recreational

programs, housing, transportation, jobs, health care, and several other factors needed to prevent diseases and manage health (Woolf et al., 2015). However, among the research studies included under this subtheme, it is unknown as to how household wealth influences the distribution and access to the aforementioned resources among South Asian populations which may increase their risk for diabetes and affect its management.

Only one study by Shah et al. (2014) utilized family income as an indicator of SES and explored its relationship to diabetes among South Asians in the US. This cross-sectional study was explored in this sub-theme of “household wealth” because household wealth (total household assets and housing conditions) is dependent on and determined by family income (the total income of the household). Furthermore, these two variables are related as they determine the households’ total economic resources (Organization for Economic Cooperation and Development (OECD), 2012). Unlike the studies by Ali et al. (2016), Chowdhury et al. (2015), as well as Corsi and Subramaniam (2012), Shah et al. (2014) focused their study on South Asians living in a South American context in addition to utilizing family income as an indicator of SES status. Shah et al. (2014) divided family income into three categories – less than \$40,000 US, \$40,000-75,000 US, and \$75,000-\$100,000 US. This categorization was used to reflect low, middle, and high family income respectively and explore the relationship between family income with diabetes prevalence and risk among South Asians.

Generally, in developed countries such as Canada and the US, it has been found that people with the lowest family income have the poorest health compared to those with higher family incomes. Health status has been shown to improve with income levels so that individuals or families with higher incomes have better health than the income groups below them (Ingen et al., 2015). Unlike previous researchers that found that increased household wealth was associated with increased prevalence and risk of diabetes in developing countries such as India, Pakistan, and Bangladesh, Shah et al. (2014) found that among South Asians in the US, a lower SES determined by family income is associated with a higher prevalence of prediabetes and diabetes. South Asians with a family income of less than \$40,000 US, were found to have a higher prevalence of diabetes (RRR = 1.51) compared to those with a family income of \$75,000 US-\$100,000 US (RRR=0.82) (Shah et al., 2014). These results are valuable as they highlight that there is a relationship between SES and the increased rates of diabetes among South Asians in a North/South American context. The reasons why or how low family income may be

associated with an increased prevalence of diabetes among South Asians in the US was not discussed by Shah and her team. However, the report by the Region of Peel as well as another report by Toronto Public Health titled *The Unequal City 2015: Income and Health Inequities in Toronto* supports Shah et al.'s (2014) finding that poor health, in this case, diabetes prevalence is higher among low-income groups in developed countries (Ingen et al., 2015; Polsky et al., 2014). Level of income shapes living conditions and health-related behaviours such as diet, and physical activity. In fact, among those in lower SES groups, there are lower levels of physical activity, low consumption of fruit and vegetables, and higher rates of obesity (Polsky et al., 2014). People with lower incomes face barriers in accessing quality food and recreational space to exercise (Ingen et al., 2015). According to Polsky and her team (2014), a higher income can make it easier to access better quality resources and services such as housing, nutritious food, and recreational activities which are essential for good health. Therefore, in developed countries that have high-quality resources (i.e., nutritious food and recreational spaces) and services, high household wealth and family income groups appear to be able to utilize these opportunities more easily as opposed to low household wealth and family income groups in which accessibility and affordability may be dependent on economic factors.

In the next section, “migration”, the second recurrent theme across the research studies on the SDH related to the increased prevalence and risk of diabetes among South Asians will be discussed.

2.3 Migration and Its Relationship to Diabetes Prevalence and Risk Among South Asians

This theme pertains to how changed working conditions such as long work hours and the stresses such as low SES and poor literacy skills following migration from a South Asian country to a Westernized country affect diabetes risk, management, and health care utilization (Lawton et al., 2006; Lucas et al., 2012; Råberg Kjøllestadal et al., 2011)

Migration is the permanent movement of an individual or population from one country to another or across borders (Douglas et al., 2019). According to the “healthy immigrant effect”, when immigrants arrive in a Westernized country, they often are healthier than the native population. However, with the additional years that they live in the country, their health status deteriorates (Hamilton, 2015). This may be due to lifestyle changes such as patterns of physical activity and dietary habits adopted in the host country, as well as health care utilization (Islam et

al., 2013). Despite the utilization of different methodologies (i.e., narrative interviews, systematic reviews, intervention study) in studies reviewed under this theme, all the researchers had the common aim of exploring the perceptions of South Asians related to their health behaviours and lifestyle choices following migration to a Westernized country (Lawton et al., 2006; Lucas et al., 2012; Råberg Kjøllesdal et al., 2011). More specifically, these researchers aimed to determine the factors that enabled or prohibited physical activity or healthy diets among South Asians who migrated to a Westernized country.

Research shows that following migration to a new country, lack of time due to daily duties, work-related responsibilities, as well as long work hours are potential challenges to participating in physical activity among South Asians – a risk factor for diabetes (Lawton et al., 2006; Lucas et al., 2012). In 2012, Lucas and his team conducted a systematic review that found that there was a strong work ethic among most South Asian migrants in the United Kingdom (UK). South Asian men reported spending most of their time working in shops or restaurants to meet the needs of their family and therefore, had extremely busy work lives. This notion of a strong work ethic among South Asians following migration was also found in Lawton and his colleagues' (2006) narrative interview study conducted in the UK with 23 Pakistani and 9 Indian diabetic participants to investigate participants experiences of undertaking physical activity as a part of their diabetes care. South Asian participants reported that they very commonly worked long hours in shops that opened early and/or closed very late. As a result, these participants increasingly reported that they found it difficult to go walking, swimming, or exercise overall (Lawton et al., 2006). To conclude, these findings suggest that when South Asians immigrate to a Westernized country, they are likely faced with long work hours and thus the inability to engage in physical activity which may lead to diabetes or the inability to manage diabetes. Although these findings are valuable, the researchers do not explore, nor do they critically analyze the reasons why immigrant South Asians must work longer hours upon migrating to a foreign country.

According to Polsky et al. (2014), when migrants move from less affluent to more affluent countries, a drop in SES is experienced. This drop in SES may be influenced by language barriers, or educational credentials that are not recognized in the host country (Polsky et al., 2014; Råberg Kjøllesdal et al., 2011). This was evident in the intervention study comprising of 198 Pakistani immigrant women performed in Oslo, Norway by Råberg Kjøllesdal

et al. (2011), in which the researchers found that there was a drop in SES among their participants following migration from South Asia to Norway. These authors argue that low SES following migration from a South Asian country was the consequence of the loss of previous professional or occupational status due to educational credentials not being recognized in Norway (the host country) and having to work in manual labour (Råberg Kjøllesdal et al., 2011). Manual labour includes work that requires physical skill and energy such as working in factories (Sohn-Rethel, 2021). This was found to be related to the higher prevalence of T2D among South Asians in Norway. According to Råberg Kjøllesdal et al. (2011), loss in educational or occupational status was found to create stress resulting from inadequate resources such as work opportunities or income – a major risk factor for T2D reported by the study participants. Furthermore, South Asian participants reported that difficulties in the ability to adopt healthy lifestyles created further psychological stresses because their main priority was to meet their daily needs such as shelter, water, and food first (Råberg Kjøllesdal et al., 2011). Thus, participants adoption of healthy diets competed with their daily survival, creating additional stresses leading to diabetes risk or diagnoses (Råberg Kjøllesdal et al., 2011). This finding is supported by Polsky et al. (2014) who claim that the psychological stresses associated with settlement in the host country can lead to unhealthy lifestyle habits such as the consumption of increased fats, meats, and processed foods as well as little physical activity which may increase the risk for developing diabetes overall. To sum up, the migration from a South Asian country to a Westernized country has been found to lead to a drop in SES among South Asian immigrants. This can result in additional stresses such as loss in income and poor work opportunities which are barriers to meeting basic needs, adopting a healthy lifestyle, and managing diabetes among South Asians.

Research also shows that South Asian immigrants have been found to have low levels of participation in the healthcare system in the country to which they migrate (Råberg Kjøllesdal et al., 2011). Råberg Kjøllesdal et al. (2011) claim that this is due to poor literacy skills in the host country in which difficulties with language can make interventions less useful for South Asian immigrants. This claim is supported by Lawton et al. (2006) who found that among the 32 South Asian respondents that were recruited for their qualitative study, 19 participants did not speak English as a first language and therefore needed an interpreter or someone else to translate during medical consultations and doctor's appointments. This dependency on others for language

interpretation was reported to create frustration and determine the participation in health care of South Asians (Lawton et al., 2006). Thus, many South Asians were not able to manage their diabetes as comprehension of the information provided by health care providers was poor or they did not want to attend appointments due to language barriers. These findings are supported by Polsky et al. (2014) who reported that several areas in the region of Peel had a higher percentage of recent immigrants at risk for developing diabetes that had no knowledge of Canada's official languages. The inability to navigate the health care system or advocate for their health needs was reported to lead to poorer access to diabetes prevention and management programs (Polsky et al., 2014). To sum up, poor literacy skills following migration to Westernized countries have been found to be associated with a lack of utilization of health care resources and services among immigrants such as South Asians. This has been found to lead to diabetes, poor management of diabetes, and additional health complications among South Asians (Råberg Kjøllesdal et al. 2011).

In the next section, “culture” – another SDH found to be related to the increased prevalence and risk of diabetes among South Asians will be discussed.

2.4 Preserving Culture Through Food and Its Relationship to Diabetes Prevalence and Risk Among South Asians

Culture can be defined as “a socially transmitted system of shared knowledge, beliefs and/or practices that varies across groups, and individuals within those groups” (Hernandez & Gibb, 2020, p.12). One of the defining characteristics of every culture which is also utilized to uphold one's cultural identity is food. This is because each culture has its own set of values and beliefs about which food items represent their culture and which foods they should consume (Sibal, 2018). These cultural food preferences and food habits can affect one's overall lifestyle and health management strategies (Mayhew, 2018). In this theme, the focus will be how cultural beliefs, values, and practices around South Asian food are related to the increased prevalence and risk for diabetes among South Asians as cultural food preferences and habits can influence overall dietary choices (Fleming et al., 2008; Morrison et al., 2014; Patel & Iliffe, 2016; Patel et al., 2021; Sidhu et al., 2020; Singh et al., 2012; Sohal et al., 2015). Thus, this section will explore the relationship between the cultural meanings attached to South Asian foods and food habits

within the South Asian culture and its relationship to diabetes outcomes and management among South Asians.

Using various qualitative research methods (i.e., case study, interviews, critical interpretive synthesis, and systematic reviews), multiple researchers sought to describe the experiences and challenges of the management of diabetes related to food consumption and overall dietary habits among South Asians (Fleming et al., 2008; Morrison et al., 2014; Patel & Illife, 2016; Patel et al., 2021; Sidhu et al., 2020; Singh et al., 2012; Sohal et al., 2015). Research shows that the dietary habits of South Asians and the foods that they consume are influenced by their cultural identity as it is the cultural habits, values, and expectations within South Asian culture that determine the foods that South Asian individuals consume. For example, in the interview studies by Morrison et al. (2014) conducted in Scotland and Patel and Illife (2014), and Singh et al. (2012) conducted in the UK as well as the critical interpretive synthesis (CIS) study by Patel et al. (2021) conducted in the UK, the researchers found that sweets, rice, roti, curries, ghee, and oil among other energy-dense foods were found to be a major part of the South Asian culture and everyday staple foods for South Asians. Patel and Illife's (2016) examined the health beliefs and behaviours of 10 British South Asians on diabetes management in London, England. They found that despite knowing that Indian cultural foods contained an excessive amount of sugar and fats as well as oil and ghee in almost everything, participants equated the consumption of these South Asian foods to the "Indian way of life". Traditional foods were described as readily available at home, social gatherings, and festivals (Patel & Illife, 2016). Thus, these South Asian participants reported immense cultural pressure from communities and family members to consume them (Patel & Illife, 2016; Singh et al., 2012).

Patel et al. (2021) in their CIS study – a systematic review that utilized techniques from grounded theory to create new knowledge, also found that specific types of food are strongly tied to South Asian culture. The researchers found that by not consuming traditional everyday staple South Asian foods such as sweets, chappati, curried vegetables, dahl, and rice, individuals belonging to the South Asian cultural identity were seen by their community to be selfish and detached from South Asian culture (Patel et al., 2021). This was a similar finding in the UK-based interview study of 20 diabetic outpatients by Singh and her team (2012) in which South Asian participants reported that they faced cultural pressures to consume South Asian foods because if they refused to consume them, they were viewed as hard to please, and overall

devalued by family members and their broader community. For example, one South Asian participant reported that when he refused to eat South Asian food items, his family would tell him that it is not going to harm him if he eats some. Participants also stated that if they did not eat South Asian foods when offered, it was viewed as a “bad” thing. Therefore, to avoid being stigmatized by one’s community and family members, participants reported compliance with cultural expectations about food (Patel et al., 2021; Singh et al., 2012). Adherence to healthy diets and the dietary recommendations for diabetics made by dietitians and health care professionals were therefore reported to be challenging due to cultural values and beliefs surrounding food and increased the risk for diabetes among non-diabetic South Asians (Morrison et al., 2014, Patel & Iliffe, 2016; Patel et al., 2021; Singh et al., 2012).

Other researchers also argued that South Asian food holds more specific social meanings than something to be consumed for health or disease prevention among South Asian participants. Several researchers exclaimed that food represents family relationships and a sense of community (Fleming et al., 2008; Morrison et al., 2014; Sohal et al., 2015). In the case study by Fleming and her team (2008) performed in Northwest England, the researchers collected data from 5 Gujrati Muslim men about their lived experiences of diabetes self-management. It was found that on typical days, in addition to birthdays and weddings, the participants reported that they would invite families to come over to eat and socialize. This was a regular practice that was observed among participants who stated that adherence to healthy diets related to diabetes was not always possible. Thus, South Asian foods were deemed to be essential to socialization and a means through which South Asians uphold their cultural relationships (Fleming et al., 2008).

This was a similar conclusion reached in the UK-based interview study conducted by Sidhu et al. (2020), in which all 13 Punjabi Sikh study participants reported that hospitality was important to their family relationships and social gatherings. Inviting families over to eat and serving traditional South Asian food was equated with “showing respect” and “being welcoming” towards family members. Furthermore, Sidhu et al. (2020) found that South Asian food and food preparation was closely associated with family reputation. Foods such as sweets and curries were considered to represent “being rich” and maintain family reputation, and thus were unavoidable for many people (Sidhu et al., 2020). In the interview study by Morrison et al. (2014), 24 participants were recruited from a randomized control trial (RCT) in Scotland led by dietitians targeting lifestyle modifications to reduce weight and prevent diabetes. The RCT

included a weight loss intervention group that engaged in 3 hours of physical activity per week and a control group that engaged in 2 hours of physical activity per week. Following the completion of the RCT, dietitians invited participants to participate in the qualitative study by Morrison et al. (2014), which aimed to explore the experiences of the participants from the RCT. Morrison et al. (2014) found that during community/family festivities which were frequent in South Asian communities, such as Ramadan, participants were not able to avoid certain foods as they were always available and expected to be shared with other members. Therefore, they felt that the dietary guidelines recommended by their dietitians did not align with their cultural habits; making the management of diabetes difficult (Morrison et al., 2014). Sohal et al. (2015), in their systematic review also found that cultural South Asian food expectations competed with the diabetic diet of South Asian participants. According to Sohal et al. (2015), participants were aware that they should avoid foods like sugar, lamb, ghee, solid fats, rice, and cereals but found it difficult to avoid in social events and their South Asian households. Given these cultural values and expectations surrounding food, as well as the threat of being devalued for not adhering to the South Asian traditional diet, participants faced barriers to implementing dietary advice related to diabetes management and prevention (Sohal et al., 2015).

In summary, these findings are valuable as they indicate that South Asian people have specific cultural values, beliefs, and practices that influence their everyday food choices and adherence to the food guidelines of their health care providers. In South Asian culture, traditional foods are utilized to preserve culture, as well as uphold family and community bonds, and traditions. South Asian foods such as sweets, rice, curries, and other starchy foods are readily available and staple items in South Asian households. This easy access to and availability of these foods, combined with the regular practices of family gatherings and consuming meals together can make their avoidance challenging. Overall, food is a symbolization of culture for South Asians, and to avoid being labelled as “non-cultural” or “difficult to please”, individuals find themselves succumbing to the consumption of traditional South Asian foods that are high in carbs, sugar, and fat. Therefore, culture influences dietary habits, making it a SDH that is related to the increased prevalence and risk of diabetes among South Asians.

In the next section, “gender” will be discussed as another SDH related to the increased risk and prevalence of diabetes among South Asians.

2.5 Gender and Its Relationship to Diabetes Prevalence and Risk Among South Asians

In the review of the literature on the SDH related to the increased prevalence and risk of diabetes among South Asians, “gender” was a recurrent SDH across five studies. The five studies included in this subtheme conceived gender as a binary category consisting of male and female. Thus, in this section, a conventional understanding of gender that refers to the binary of “male” and “female” will be utilized following assumptions of gender used in the reviewed studies. Gender is referred to as what is socially recognized to be feminine or masculine (Raphael, 2016). More specifically, conventional, and binary gender ideals consist of socially constructed roles, attitudes, behaviours, and values. Male or female gender roles and identities can serve as a risk factor for disease by influencing health behaviours (Government of Canada, 2012). This section will focus on how South Asians who identify as females encounter unique challenges to the prevention and management of diabetes due to the gender expectations and roles placed on their identity. It is important to note, that the lack of discussion of the male gender in this theme is because of the absence of studies on diabetes prevalence and risk in relation to male gender roles and expectations among the South Asian community.

Across the five studies reviewed, the researchers shared the common aim of exploring the relationship between culture and one’s gender identity in relation to diabetes outcomes and the self-management of diabetes among South Asians (Lawton et al., 2006; Morrison et al., 2014; Majeed-Ariss et al., 2015; Sidhu et al., 2020). In the qualitative exploratory study by Majeed-Ariss et al. (2015), the researchers explored the relationship between gender and the dietary habits of 15 South Asian diabetic women in England. This study was significant because healthy dietary habits are known to be important to the successful prevention and management of diabetes and only this study was found that focused on the relationship between gender and the dietary habits of South Asian diabetics. According to Majeed-Ariss et al. (2015), South Asian women found it difficult to manage their diabetes due to the gender expectations related to being a homemaker, mother, and daughter-in-law placed on them by their husband and in-laws as well as having to meet the needs of their family before themselves. These gender roles were created by the broader society and adopted by individuals during their interactions with the environment and others. Majeed-Ariss et al. (2015) argue that the South Asian women in their study were expected to cook foods that satisfied the needs of their husband, children, and family first before considering themselves. Furthermore, these women claimed that they were often too busy

performing domestic chores which led them to eat whatever they cooked for everybody else because they had no time to prepare something for themselves (Majeed-Ariss et al., 2015). To sum up, there is immense pressure among South Asian women to meet their family's needs before the management of their own diabetic conditions. This can make the management of diabetes among South Asian women difficult.

Other researchers argue that physical inactivity is common among South Asian females (Lawton et al., 2006; Lucas et al., 2013; Morrison et al., 2014; Sidhu et al., 2020). In the interview study of 13 Punjabi Sikh participants by Sidhu et al. (2020), females expressed the need to prioritize their family over physical activity because physical activity was seen as a selfish practice among the South Asian community. In fact, most female participants reported that the elders of their family such as their in-laws or parents perceived exercise as a 'waste of time' and saw cooking as a priority that was important in a woman's role in marriage. This was a similar conclusion made by Lucas et al. (2013), who found that "exercise" among South Asian females in the studies that they reviewed was viewed as a selfish activity by their husband and family because it took a woman's attention from her domestic duties such as cooking. Thus, women, due to pressures to be a "good mother and wife" and fit into the notion of "family first" complied to domestic duties and responsibilities while restricting themselves from engaging in physical activity that could prevent or manage diabetes (Lucas et al., 2013). This was also evident in the study by Morrison et al. (2014), in which one female South Asian participant reported that she could not go on walks because of her domestic commitments such as having grandchildren to take care of, or if she did exercise, it was seen as a selfish act detracting from family care. Furthermore, Lawton et al. (2006) found in their qualitative study that South Asian females were expected to stay at home after marriage. As a result, these women refrained from engaging in physical activity outside the home due to this gendered expectation placed on them that they should stay at home and avoid the male gaze (Lawton et al., 2006). More specifically, Lawton et al. (2006) argue that in the South Asian community, the cultural taboo that women should not expose their bodies to males was predominant and prevented females from engaging in physical activity such as swimming or walking.

To sum up, the gender beliefs, and expectations prominent among the South Asian ethnicity poses challenges for women in managing and preventing diabetes via healthy diets and physical activity. It is important to note that there is a paucity of studies that explore how the

male gender may create unique challenges in adopting healthy diets and engaging in physical activity among South Asians in relation to diabetes prevention and management.

Overall, in the review of the literature on the SDH related to the increased prevalence and risk of diabetes among South Asians, the key SDH that were identified were SES (educational attainment and household wealth), migration, preserving culture through food, and gender. A summary of the main findings from the literature review will be provided in Chapter 3, the discussion. This will then lead to discussion of the major gaps that were found across the literature. To demonstrate the necessity of employing a SDH approach to address the diabetes burden among South Asians in Canada, additional evidence from studies conducted with other ethnic groups that focus on the same SDH will be included. Following this, the major strengths and limitations of this major project will be provided.

Chapter 3- Discussion

This chapter highlights the main results of the literature review and its relevance to the proposed research question which is: ***“What are the social determinants of health that are related to the high prevalence and risk for diabetes among South Asians in Canada?”***

This chapter will also address the four major gaps identified across these studies related to the research question.

3.1- Summary of the Literature Review Findings

This major project identifies that the SDH approach to understanding diabetes risk, prevalence, and management helps to address and determine solutions to tackle the high prevalence and risk of diabetes, specifically T2D, among South Asians in Canada. This is because the SDH approach gives importance to the social, economic, cultural, and political factors that influence health and health-related behaviors and looks beyond biological and behavioural risk factors which remain predominant in diabetes research among South Asians. The high prevalence and risk of diabetes, especially T2D among South Asians, needs to be understood from a SDH perspective. The SDH approach addresses how the living and working conditions surrounding South Asians, affects their risk for diabetes, diabetes-related outcomes as well as its management. This approach is different than traditional biomedical and behavioral explanations that blame individuals for their diabetes and the poor management of it. Though the biological and behavioural approach to diabetes has been proven useful in diabetes diagnosis, risk assessment, and treatment, it is clearly not enough to address the continued high prevalence and risk of T2D among South Asians in Canada.

In the literature review, SES (i.e., educational attainment and household wealth) was highlighted as a key SDH strongly related to the increased prevalence and risk of diabetes among South Asians. Consistent with the claims made in the studies performed in India, Pakistan, and Bangladesh by Ali et al. (2016), Chowdhury et al. (2015), and Corsi and Subramaniam (2012), Seigle et al. (2020) also highlight that there is a strong relationship between high SES (high educational attainment and high household wealth) and the increased prevalence and risk of diabetes among the general population in 29 developing countries. Using data from 29 nationally representative surveys conducted between 2008 and 2016, Seigle et al. (2020) aimed to estimate the prevalence of diabetes and understand its relationship to educational attainment, household

wealth, and BMI across various developing countries. Seiglie et al. (2020) found that there was an estimated increase in the risk of diabetes by 47% in low-income developing countries such as Bangladesh, Nepal, and Tanzania among participants who completed secondary school or above compared to those with no formal schooling. Furthermore, participants belonging to the highest household wealth category were 1.19 times more likely to have diabetes compared to groups belonging to the lowest household wealth category across the developing countries. According to Seiglie et al. (2020), the relationship between high SES and the high prevalence and risk of diabetes across developing countries rests on the fact that citizens of high SES consume large amounts of energy-dense foods and have lower levels of physical activity. Whereas, in developed countries such as the US which have higher economic growth, citizens with a high SES can adopt healthier diets and participate in higher levels of physical activity (Seiglie et al., 2020).

These claims made by multiple researchers take a behavioural approach to understanding diabetes and focus on individuals' choices regarding their diet and physical activity habits. The researchers overlook how decisions relating to diet and exercise are influenced by external factors such as educational attainment which then determines one's income and employment opportunities as well as food availability and access to green space to exercise. In fact, there is a paucity of studies that specifically explore "why" or "how" SES (i.e., educational attainment or household wealth) influence diabetes prevalence and risk among South Asians as well as lifestyle behaviors such as diet and exercise in developing and developed countries. For example, do individuals of high SES in developing countries have more access and availability to foods that are higher in fat and sugar compared to fruits and vegetables that lead them to adopt unhealthy diets? Are South Asians belonging to lower SES in developing countries not able to afford food regardless of its nutritional quality, putting them at lower risk for diabetes because they consume less food as a whole?

When I was in Sri Lanka in 2018, my parents and I visited our families who belonged to a lower SES. I remember my aunts and uncles telling me that they had dropped out of high school when they were younger because they had to take care of their family or that they could not afford to pay tuition. Due to their poor educational attainment, they had a lifetime of lower incomes because they could only find work in farming and factories that paid less than other jobs. A low income made meeting day to day living expensive and very difficult. All my

extended families in Sri Lanka had older children from overseas sending them money every month to help pay for electricity, rent, food, and tuition for their siblings. In contrast to these families, I also had families in Sri Lanka with a higher SES who lived in lavish homes and were considered wealthy. In both the low SES and high SES households, all family members had some type of chronic disease, and they would specifically speak about having “sugar” – another term used among the South Asian community to refer to diabetes. Despite having diabetes, my aunts and uncles belonging to both low SES and high SES households continued to eat large amounts of rice, roti, starchy vegetables, sweets, and other unhealthy foods. However, I did see differences in the frequency of meals and portion sizes of meals that low SES families and high SES families were consuming. Families with a higher SES consumed unhealthy foods more frequently and in large quantities daily; whereas families of lower SES consumed less food as a whole and had fewer meals throughout the day. The families of higher SES told me that they spent lots of money on food items and consumed lots of snacks. Whereas families of lower SES told me that they had a limited budget for food expenditures due to the necessity to meet other immediate needs such as rent, electricity, water, sanitation, and paying school tuition. This meant that the families of lower SES consumed less meals as affordability of food was an issue.

Access to and availability of healthy food within the proximity of one’s household was also another major barrier that I understood to be a factor increasing T2D risk among South Asians with high SES. During my travels to both Sri Lanka and India – countries populated with Indians, Pakistanis, Sri Lankans, and other South Asian groups, I noticed that the areas in which I stayed had grocery stores that were 30 minutes away by drive or a 1-hour walk. In these stores, there was also not a large selection of fruits or vegetables available. Both, family members and friends with a higher SES were able to pay for a taxi or had their own car to drive to stores to purchase food, such as chips, sweets, and fried pastries. Families with a lower SES could not afford transportation to get to grocery stores, and the walk was too long so these individuals consumed food that was readily accessible. Furthermore, I noticed that there were many fast-food stalls set up on residential streets that sold roti, fried foods, and sweets for high prices. These foods were not affordable for those of lower SES and so many South Asians of higher SES consumed these food items which were linked to an increased risk of T2D. To conclude, even though both low SES and high SES South Asian groups in developing countries are at risk for T2D, those of higher SES are at most risk due to their ability to afford costly fast-food items

within proximity to their homes coupled with their ability to drive or take taxis to grocery stores to purchase large quantities of food for frequent consumption compared to those of low SES.

During my visit to Sri Lanka and India, I also noticed that family members and friends of higher educational attainment/SES engaged in less physical activity than those of lower educational attainment/SES. A possible explanation for this observation is provided by the systematic review by Cheema et al. (2014), as well as the cross-sectional study by Asiamah et al. (2019), in which the researchers aimed to understand the factors linked to the high prevalence of diabetes and physical inactivity among South Asians in India and Ghana, respectively. According to Cheema et al. (2014), India, as well as other South Asian countries, have been rapidly undergoing urbanization. Urbanization is “the process by which rural areas become urbanized as a result of economic development and industrialization” (Peng et al., 2010, p.2). In other words, urbanization occurs when small rural areas with poor infrastructures grow into larger and heavily populated cities, resulting in changes to the demographic, political, and economic environment (Peng et al., 2010). Cheema et al. (2014) explain that one of the reasons that certain South Asians groups may have higher rates of T2D in India is because of the process of urbanization, which has led to increased physical inactivity– a risk factor for diabetes. This finding can be further explained by the cross-sectional study by Asiamah et al. (2019) consisting of 504 participants, in which the researchers argue that urbanization led participants with higher educational attainment to have higher rates of physical inactivity associated with diabetes in Ghana. This is because higher educational attainment was linked to urban living as well as employment in urban offices, which was associated with increased work responsibilities and higher work commitments from participants. This meant that South Asians with higher educational attainment had little time to engage in physical activity. Alternatively, participants with lower educational attainment in Ghana were mostly employed in unskilled/manual labour or factories and even walked to work, thus increasing their participation in physical activity (Asiamah et al., 2019). Therefore, urbanization has been found to be related to the increase in physical inactivity among those of higher educational attainment in developing countries, leading to diseases such as diabetes. To conclude, the effects of urbanization and its relationship to educational attainment and SES provide possible explanations for the finding by Ali et al. (2016), Chowdhury et al. (2015), and Corsi and Subramaniam (2012) that there is an increased prevalence and risk of diabetes among South Asians with a higher educational attainment/SES in South Asian developing countries.

Types of risks factors might also make a difference in relation to the prevalence and risk of T2D among South Asians in developing countries who have different SES statuses, indicated through educational attainment and household wealth. Ali et al. (2016) were the only group of

researchers that found that the risk for diabetes varied among South Asians with higher or lower SES (i.e., educational attainment and household wealth) depending on whether the risk factor was weight-related or behavioural. There is little support for the finding by Ali et al. (2016) that diabetes risk is the highest among South Asian adults in South Asian countries with higher educational attainment (undergraduate/graduate degrees) and high household wealth, which was equated with higher SES, based on weight-related risk factors. Thus, it is not well understood why a higher SES in South Asian countries may expose South Asians to a greater BMI or weight – a risk factor for T2D. However, the finding that the risk for diabetes is the highest among South Asians in South Asian countries with lower educational attainment (high school education or less) and low household wealth which was equated with lower SES, based on behavioural risk factors (fruit and vegetable intake) is supported by grey literature (Dizon & Herforth, 2018; Health and Stroke Foundation, 2013). The consumption of fruits and vegetables is known to reduce the risk for chronic diseases such as diabetes and CVD (Minaker & Hammond, 2015). According to a policy paper published in South Asia by Dizon and Herforth (2018), nutritious foods such as fruits and vegetables are costly in South Asia which results in reduced consumption among its citizens. Thus, in South Asian countries, people with lower SES often must purchase more affordable foods which are less nutritious and energy-dense such as rice, roti, starchy vegetables, and sweets (Dizon & Herforth, 2018; Patel et al., 2021). The increased consumption of these available food items is linked to an increased risk for T2D (Patel et al., 2021). Therefore, South Asians of lower SES at most risk for developing diabetes in South Asia based on behavioural risk factors (fruit and vegetable consumption).

To conclude, the study by Ali and his team (2016) highlights the need to assess the relationship between diabetes risk among South Asians by exploring various types of risk factors such as weight-related and behavioural risk factors in relation to their SES (i.e., educational attainment and household wealth). Regarding behavioural risk factors related to diet, even in Canada, most residents regardless of ethnicity, fail to meet the recommended daily guidelines for fruit and vegetable consumption which is an average of seven servings per day for individuals aged 19 years old and above (Heart & Stroke Foundation, 2013; Minaker & Hammond, 2015). According to the Health and Stroke Foundation (2013), the inability to meet the recommendations of Canada's Food Guidelines is also associated with lower education and income. However, there is a lack of scholarly research which examines the relationship between

SES and fruit and vegetable intake among South Asians and other ethnic groups in both developing and developed countries. There is also a lack of literature that explores the relationship between SES and physical activity patterns among South Asians and other visible minority groups concerning diabetes in developing and developed countries. Exploring relationships between T2D and different types of risk factors for T2D utilizing a SDH approach can help to determine solutions and management strategies oriented towards South Asians belonging to each SES category that addresses food security and food access as opposed to one solution that fits all.

Contrary to the studies performed in South Asia and other developing countries which showed a higher SES (i.e., higher educational attainment and high household wealth) was related to a higher prevalence and risk of diabetes among South Asians, Shah et al. (2014) highlighted that in developed countries such as the US, lower educational attainment (less than a bachelor's degree) is related to a higher prevalence and risk of diabetes among South Asians. These findings are consistent with a qualitative study by Tenkorang (2017) that showed that the relationship between lower educational attainment and the increased prevalence and risk of diabetes also applies to other ethnic communities and visible minority groups within Canada. Utilizing data from the 2013 Canadian Community and Health Survey (CCHS) - a survey that collects information about the health of Canadians at the community level, Tenkorang (2017) examined the factors that contribute to the first onset of diabetes among immigrant and visible minority groups in Canada such as South Asians, Blacks, Chinese, and Filipinos among others. According to Tenkorang (2017), most immigrant groups in Canada including South Asians - the largest visible minority group in Canada, have less than a bachelor's degree and are diagnosed with diabetes at an earlier age than their Caucasian counterparts. These findings are the result of educational credentials from migrating countries not being valued in the Canadian job market. This results in low incomes and economic vulnerability for immigrants that translate into health disadvantages. Contrarily, immigrants with higher educational attainment in Canada were found to be more likely to have a higher income, which increased their access to crucial resources for adopting healthy lifestyles (Tenkorang, 2017). Furthermore, immigrants with higher educational attainment were found to have more knowledge of diseases and how they can be avoided. Thus, having higher educational attainment was highlighted as a protective measure against developing

diabetes among immigrant groups such as South Asians and the general population in Canada (Tenkorang, 2017).

The finding that lower educational attainment is associated with a higher prevalence and risk for diabetes among South Asians in developed countries can also be understood by identifying the effects of urbanization on lifestyle behaviours. In the critical literature review by Thibault et al. (2016), the researchers aimed to identify the factors related to the increased prevalence of diabetes among the general Canadian adult population in New Brunswick. According to Thibault et al. (2016), urbanization is linked to sedentary work and lower levels of physical activity, which can lead to poor health outcomes. To support this finding, Gassasse et al. (2017) explain in their cross-sectional study that analyzed data from 207 countries, that the lower levels of physical activity associated with urbanization are due to urban cities being structured with many buildings, crowded housing, large supermarkets, and little green space. This can impact the lifestyle choices (exercise habits) of individuals, especially in developed countries, as individuals may not have a suitable physical environment to engage in physical activity (Gassasse et al., 2017). According to Gassasse et al. (2017), the physical inactivity associated with living in highly dense and overcrowded urban conditions can then lead to higher rates of T2D. Therefore, South Asians residing in urban regions of Canada may have limited availability and access to green spaces and recreational spaces to exercise. This means South Asians of higher educational attainment/SES with secure and high-paying jobs can afford to purchase gym memberships or attend fitness classes when their built environment is a barrier to engaging in physical activity. Furthermore, South Asians of higher educational attainment may also possess the health literacy in addition to the economic resources needed to offset the disadvantages of urban living which can prevent diabetes. Contrarily, South Asians with a lower educational attainment may lack secure and good-paying jobs which can prevent them from engaging in physical activity when access and affordability to recreational and fitness opportunities is compromised. To conclude, understanding the relationship between educational attainment and urbanization and how both factors can influence the physical activity behaviours of South Asians in Canada can help to reduce the prevalence of diabetes.

Another significant finding identified in the literature review was the strong relationship between a lower SES indicated through low family income and the increased prevalence and risk of diabetes among South Asians in the US (Shah et al., 2014). These findings can be further understood through the qualitative interview study by Pilkington et al. (2010) that was conducted in Canada. In this study, the researchers aimed to understand how low income affects patients' self-management of T2D. Although Shah et al. (2014) utilized family income to measure SES in their study and Pilkington et al. (2010) utilized individual income, both constructs represent SES

and are related to an enhanced understanding of SES. This relationship stems from each household members' personal income that is summed together to represent family income. Pilkington et al. (2010) argue that those in Canada that live on a low-income face difficulty in deciding whether to purchase good-quality food or diabetes medication because they have more important priorities such as paying the rent. For example, one participant stated that her competing priorities for housing led her to purchase cheaper foods such as rice due to the limited funds available after paying rent. Participants were aware that consuming large quantities of rice was linked to higher sugar levels, but it was one of the predominant staple foods that was available and affordable to low-income Canadians (Pilkington et al., 2010). Thus, these findings illustrate that in Canada, belonging to a lower SES may be a factor that makes it difficult for South Asians to purchase healthy foods since they must consider more immediate concerns first such as housing and rent.

It is important to note that the findings by Shah et al. (2014) are also consistent with another cross-sectional study performed in Saskatchewan, Canada which aimed to understand the relationship between income and T2D among Canadians (Bird et al., 2015). According to Bird et al. (2015), a low-income in Canada is associated with physical inactivity and a decreased usage of health services, increasing the risk for diabetes. In fact, 9% of those with an income of \$29,999 CAD per year or less had diabetes compared to 2.7% of those who had an income of \$80,000 CAD per year or more (Bird et al., 2015). According to Bird et al. (2015), it was found that physical inactivity – one of the leading causes of diabetes varied significantly between low-income Canadians and high-income Canadians (58% and 36.5%, respectively) (Bird et al., 2015). These findings explained that those with a lower income may not have access to green spaces or playgrounds within their neighbourhoods to engage in exercise (Bird et al., 2015). Furthermore, low-income individuals and families may not be able to afford exercise programs or attend gyms in Canada because they have costly admission and membership fees. In addition, individuals and families with a low income were also found to have reduced access to health care services because they lived in poor neighbourhoods in which transportation was an issue (Pilkington et al., 2015). Thus, it can be understood that decisions around health behaviours are influenced by external factors such as the availability and cost of infrastructures to engage in exercise as well as accessibility to health care services.

The understanding of the relationship between individual and family income and diabetes is significant to addressing diabetes among South Asians, as both individual and family income are one of the most important SDH (Mikkonen & Raphael, 2010). In Canada, food, housing, post-secondary education, and recreational activities as well as certain health services and medications must be bought and paid for by individuals. A low SES (i.e., low individual or family income) predisposes individuals to material and social deprivation which can cause individuals and their families' inability to afford the basic prerequisites of health such as food and housing (Mikkonen & Raphael, 2010). The prevention of diabetes and its management via healthy diets and physical activity among South Asians depends on one's socioeconomic conditions. Therefore, more research is needed that explores the socioeconomic conditions of South Asians in Canada and how they influence their diabetes risk and management.

Another key SDH that was identified in the literature review related to the increased prevalence and risk of diabetes among South Asians was migration. Current studies highlight that following migration from a South Asian country to a Westernized country, individuals experience a drop in SES as their previous professional or occupational statuses are not valued or accredited in the labour market of the host country. The educational credentials associated with the professional/occupational statuses were not recognized in the host country resulting in low incomes and limited work opportunities (Råberg Kjøllestad, 2011). Consequently, South Asians faced challenges in adopting healthy lifestyles (i.e., healthy diets and physical activity) to prevent and manage diabetes due to lack of time because of daily duties, working long hours, and work-related responsibilities in jobs they could obtain such as in restaurants, shops, and manual labour (Lawton et al., 2006; Lucas et al., 2012; Råberg Kjøllestad et al., 2011). The importance of this finding is further reflected through a Canadian-based qualitative study conducted by Adjei et al. (2020) which utilized data from the 2014 CCHS survey. Adjei et al. (2020) explored the effects of migration on the health of visible minority groups such as Blacks, Chinese, South Asians among others in comparison to Caucasian groups. The researchers argue that international migration is strongly associated with low SES, employment vulnerability, and socio-psychological stress. As a result of these risk factors, long-term immigrants have a higher likelihood of developing poor health outcomes, especially diabetes compared to their native-born counterparts. Adjei et al. (2020) also argue that because of the stresses associated with migration such as low SES, scarcity in employment opportunities, and the stresses associated with post-

migration, immigrants may adopt coping behaviours such as little physical activity coupled with the excess consumption of high fat, sugar, and high sodium diets which can predispose them to poor health outcomes. The studies that were reviewed on the South Asian population explored the effects of migration on physical activity but not on diet. It is therefore significant to understand the continued lack of emphasis in research on the effects that migration may have on the dietary habits and food consumption patterns of South Asians in Canada. Therefore, studies among the South Asian populations in Canada need to explore how dietary habits are influenced by the migration process and its consequences.

Overall, stresses associated with migration, especially finding a job with a good salary to sustain a good quality of life and provide for one's family has consequences to health. For example, when the educational credentials of migrants from South Asia to Canada are not recognized, they are forced to settle for low-income jobs or complete more schooling in Canada. This may be a factor that puts them at risk for developing T2D, as they might not be able to afford healthy foods. For example, when my dad arrived in Canada, he had little knowledge of English and limited job opportunities until he learned how to speak and write in English. His desire to be successful and provide for his family pushed him to work more than 12 hours so that he could earn enough money to support his family. My dad would buy foods that were affordable such as rice, oil, and flour, as opposed to fruits and vegetables. Furthermore, after returning home after a long day of work, he would consume foods high in fats, sugar, and carbohydrates. The consumption of heavy meals and South Asian foods was his coping mechanism for his stress and over time I saw the effect that his lifestyle behaviors had on the development of diabetes. My father's decisions regarding his lifestyle were not his fault, and this is the case for many other South Asian immigrants. I am aware that the socioeconomic conditions following his migration to Canada strongly influenced his health-related behaviours.

The relationship between migration as a SDH linked to the increased prevalence and risk of diabetes among South Asians in Canada can also be further explained by understanding the effects of urbanization for migrants. In the systematic review by Ruiz-Alejos et al. (2018), the researchers aimed to estimate the incidence of T2D among residents that migrated within Peru from rural to urban regions. Ruiz-Alejos et al. (2018) found that among individuals that migrated from rural to urban areas within Peru, there was an increased risk for T2D because of changes in lifestyle behaviours (diet and exercise habits) upon arrival to urbanized areas. In fact, according

to Ruiz-Alejos et al. (2018), urban-dwellers face a 4-fold greater risk of developing T2D due to the influence that urban living has on the lifestyle choices of migrants. Gassasse et al. (2017) in their cross-sectional study explain that urbanization influences the lifestyle choices of individuals because urbanization allows food producers to increase the supply of energy-dense foods and high caloric drinks in markets at cheaper prices than nutritious healthier foods. Thus, healthier foods such as fruits and vegetables are assigned higher prices in grocery stores. This means migrants of lower SES may not be able to afford healthier food options, leading them to purchase foods sold at cheaper prices which are energy-dense and consist of higher calories (Gassasse et al., 2017). These findings apply to the South Asian migrant population in Canada as most foreign-born populations and visible minorities in Canada often migrate to either Ontario, British Columbia, Quebec, or Alberta. These four provinces are the most heavily populated and largest urban centres in Canada (Statistics Canada, 2011). Thus, in these highly urbanized provinces that South Asians choose to migrate to, food-related decisions may be influenced by access and affordability to healthier foods, which are influenced by urbanization and industrial practices.

Culture, more specifically preserving culture through food, is another key SDH identified to be related to the increased prevalence and risk of diabetes among South Asians. The finding that the dietary habits of South Asians and the foods that they consume regularly are strongly linked to their relationships and values within the South Asian culture is interesting. Research highlights that food items such as roti, rice, curries, and sweets are known to be high in carbs and sugar and are readily available in South Asian homes. These food items symbolize cultural and family traditions and are used to uphold familial relationships. Furthermore, not consuming South Asian foods was found to be equated with being “uncultured”. These findings are consistent with the study by Cooper Braithwaite and Lemonde (2016) which utilized focus groups and surveys to explore the beliefs held by 14 adult Caribbean immigrants regarding their T2D and prevention strategies in Ontario. These researchers found that the cultural practices of African immigrants to Canada influenced dietary behaviours related to preventing T2D. Braithwaite and Lemonde (2016) highlight that most African participants preferred consuming traditional African foods, high in carbs with some protein over other types of food and were not willing to give up their traditional diets. Caribbean participants viewed the consumption of Caribbean food items and the preparation of Caribbean meals as a way of maintaining their cultural heritage in Canada. These findings are valuable to this project which focuses on South

Asians because it may apply to other visible minority groups. Their study supports the finding that cultural beliefs and habits influence the dietary habits of individuals. It is well-known that dietary habits are a risk factor for diabetes, but what foods a person chooses to consume is influenced by their cultural values, beliefs, and habits. Therefore, there is a strong relationship between culture and the increased prevalence and risk of diabetes among South Asians, but more Canadian-based studies are needed to explore this relationship in depth.

Gender was the last key SDH found in the literature review to be related to the increased prevalence and risk of diabetes among South Asians. Current studies performed in South Asia highlight that women experience challenges in preventing and managing diabetes via healthy diets due to traditional gender roles and expectations placed on them by their families and the broader South Asian community to be a homemaker, mother, and daughter-in-law. These gender roles place limitations on women as they are expected to care for the dietary and health needs of their husband and family first before their own (i.e., cook foods that their family chooses) (Majeed-Ariss et al., 2015). Though there are currently no research studies that explore the relationship between the female gender and diabetes among South Asians in Canada; the above findings still apply. For example, my mother is a stay-at-home wife, and growing up she was told by her parents to conform to the gender roles of being a wife which included cooking, cleaning, taking care of her husband and children. Due to her upbringing, my mom has always performed these gendered expectations daily. In fact, when it comes to food choices, my mother always consumes foods that my dad and her children want to eat as opposed to the foods recommended by her physicians for her borderline diabetes and cholesterol. Thus, gender roles and expectations strongly affected her dietary choices. This is probably the situation for many women in the South Asian community in Canada in which they are unable to adopt healthy lifestyles or make dietary related changes as per their doctor's guidelines due to the pressures placed on them by their families and society, to maintain the traditional roles of being a woman. However, there is a lack of studies that explore this relationship between gender – an important SDH, food habits, and diabetes among South Asians in Canada. Furthermore, the male gender may also impose constraints on the dietary choices of South Asian men, but this is not explored in the literature in developed or developing countries. To date, no studies were found among other ethnic minority groups or South Asians that examined the relationship between male gender roles and their effects on diet in relation to diabetes, CVD, or other chronic diseases.

In addition to the effects that gender has on the dietary choices among South Asian females, gender has also been shown to be a barrier to the participation of female South Asians in physical activity – another risk factor for T2D (Lawton et al., 2006; Lucas et al., 2013; Morrison et al., 2014; Sidhu et al., 2020). This is important because the expectation placed on South Asian females to not engage in exercise because it is viewed as a selfish activity that detracts from meeting domestic tasks such as cooking, and childcare can lead to diabetes or poor management of it. Furthermore, South Asian women have been found to report a lack of time due to domestic duties as a barrier to the management of their diabetes (Lawton et al., 2006; Lucas et al., 2013; Morrison et al., 2014; Sidhu et al., 2020). These findings apply to the Canadian context as they are consistent with the results of a qualitative descriptive study that aimed to understand how the experience of being new to Canada affects participation in physical activity among various ethnic groups (Curtin et al., 2016). Among visible minority women, Curtin et al. (2016) found that most female participants reported they had a lack of time to engage in physical activity due to domestic commitments and priorities (i.e., taking care of children and family). For example, one participant reported that she had to pick up her kids from school and then take them to multiple extracurricular activities such as swimming and karate (Curtin et al., 2016). In addition, to enhance these results, a qualitative study by Caperchione et al. (2015) utilized interviews to examine gender-associated perceptions of the barriers and facilitators of physical activity among 204 Punjabi South Asian adults in Canada. Caperchione et al. (2015) found that most South Asian female participants spent their time cooking and cleaning as well as going to work outside the home and reported that they had no time to do exercise. Thus, lack of time due to the gender roles and expectations placed on women to take care of the household and their children while men are working outside the home is a common barrier to physical activity across visible minorities including South Asians– a known risk factor for T2D.

To further support the finding that traditional gender roles/expectations impose constraints on female South Asians from the uptake of healthy diets and physical activity, it is useful to understand the relationship between gender, family social capital, and family social support. In the systematic review by Khazaeian et al. (2017), the researchers aimed to explore the impact of social capital and social support on the overall health of female-headed households in Iran. Social capital is the norms, attitudes, values, and networks that facilitate individual and collective action, social cohesion, trust, and long-lasting relationships (Khazaeian et al., 2017).

Family social capital is one of the most important types of social capital and is defined as the factors that influence the behaviours, beliefs, and values of individuals towards each other in a family (Khazaeian et al., 2017). Family social capital undermines the family social support that diabetic South Asian women receive such as time needed to exercise or prepare healthier meals for their diet. Family social support is the emotional, informational, and instrumental support that an individual receives from their family (Gomes et al., 2017). Possessing family social support allows individuals to feel safe, taken care of, valued, and esteemed within their family (Khazaeian et al., 2017). To feel accepted within South Asian families, South Asian women like my mother often conform to long standing cultural norms such as cooking traditional meals to satisfy their husband and children, as well as refraining from physical activity to maximize time for their familial duties. Both family social capital and family social support is influenced by gender. This can result in poor diabetic outcomes for South Asian females as females find themselves trying to maintain their family relationships by conforming to demanding norms and attitudes placed on them by their family which may not support healthy lifestyle choices.

Females from South Asian families who choose to deviate from gendered norms, roles, and expectations regarding diet and exercise may not receive adequate family social support to prevent and self-manage their diabetes. This was evident in the RCT by Gomes et al. (2017) performed in Brazil in which the researchers aimed to investigate how the inclusion of family social support in an education program for diabetes could help improve the clinical outcomes of 164 outpatients with diabetes. The intervention group consisted of a diabetic educational program for diabetes which contained a family caregiver to assist in diabetes education and motivate participants; whereas, the control group did not have a family caregiver present. Gomes et al. (2017) found that the likelihood of adopting healthy lifestyle behaviours learnt from the educational intervention was dependent on the norms and expectations among families (i.e., family social capital). Many South Asian women, including my own mother, were raised from an early age to stay home to avoid being seen by other males and raised to cook traditional South Asian foods to preserve South Asian culture. Furthermore, South Asian women are also expected to care for the dietary and personal needs of their husband, children, and elderly in their household first before themselves. Hence, my mother like many other women, put the needs of her family first before her own.

Women, especially South Asian women may not always receive the family social support they need to prevent or manage diabetes because of the traditional gendered norms and expectations that influence the families support to them. This was especially evident when my grandma used to live with us and provided my mother with minimal emotional, instrumental, or informational support when she was diagnosed with pre-diabetes. The doctors told my mother that she needed to consume less South Asian foods and more lean meats, and vegetables in addition to engaging in exercise. However, when my mom cooked non-fried foods and vegetables instead of curry, my grandmother was not happy. My grandmother believed that my mother should be cooking South Asian meals for the entire family regardless of being at risk for T2D. She also strongly believed that it was the duty of the female in the house to make sure that her culture was being preserved and that the dietary needs of the men came first before women. This led my grandmother to not give my mother opportunities to cook healthier meals for herself or family and not engage in physical activity. Thus, for South Asian females including my mother, family can pose constraints on the uptake of healthy diets and adoption of physical activity outside of the home (Gomes et al., 2017).

Through the literature review, the paucity of studies that focus on the relationship between male gender roles and expectations among South Asians and its influence on diabetes outcomes in both developing and developed countries was evident. However, when exploring studies performed with other visible minority groups outside of the South Asian ethnic group, it became evident that males are also subjected to gender expectations that make behaviours such as engaging in physical activity challenging. In a US-based qualitative study by Griffith et al. (2011), the researchers examined the factors that influenced the overall health behaviours of African American men. According to Griffith et al. (2011), African American male participants treated their roles as a provider, father, and spouse as more important than engaging in physical activity. This was because their families and communities reinforced the notion that “men must provide for their families and care for them” (Griffith et al., 2011). Therefore, many of these men had busy work schedules to provide for their family which constrained their ability to engage in physical activity. Therefore, among African American men, being physically active and taking care of their health was less important than fulfilling their obligations as a male.

It is important to note that the study by Griffith et al. (2011) did not focus on diabetes or T2D but discussed the overall influence of the male gender on physical activity levels and its

relationship to overall health. These findings are still valuable to South Asian diabetes research as it demonstrates that gender plays a role in the lifestyle choices (physical activity habits) of individuals – a risk factor T2D among South Asians. Thus, we need research that explores the relationship between male gender expectations and roles concerning diabetes among South Asians in Canada. Research evidence shows a strong relationship between male gender roles and expectations among other visible minority groups such as Blacks and their health behaviours. Thus, examining the relationship of gender roles with the physical activity levels of South Asian men and women – another visible minority group in Canada can be beneficial in understanding the high prevalence and risk of T2D among South Asians in Canada.

In section 3.2 below, the major gaps found across the literature on the SDH related to the increased prevalence and risk of diabetes among South Asians will be provided. Through the identification of these major gaps, the reader will be able to better understand why the recommendations that will be made in Chapter 4 of this major project must be implemented immediately to tackle the diabetes burden among South Asians in Canada.

3.2 – Summary of the Gaps in the Literature

Four major gaps exist within the literature reviewed on the SDH related to the increased prevalence and risk of diabetes among South Asians in Canada. The first gap is related to the research question for this project. Current evidence fails to address the research question “What are the SDH related to the increased prevalence and risk of diabetes among South Asians in Canada”? Diabetes rates among South Asians in Canada and globally are extremely high, but the influence of SDH on these increased rates of diabetes among South Asians continues to be under-explored. A substantial amount of literature continues to take the dominant biomedical and behavioural approach to understanding diabetes among South Asians. Overall, the lack of culturally based research studies which address this research question may contribute to the continued inability to reduce the high prevalence and risk of diabetes among South Asians in Canada.

Secondly, while some studies show a relationship between specific SDH such as SES, migration, culture (preserving culture through food), and gender to diabetes among South Asians, not all the studies go into detail or critically analyze “why” or “how” these SDH influence diabetes outcomes. The studies that focused on migration and preserving culture

through food, briefly described how each SDH puts South Asians at increased risk for diabetes and affects the lifestyle choices related to diabetes management. However, the studies that focused on the relationship between SES (i.e., educational attainment and household wealth) in relation to diabetes among South Asians mostly did not provide any explanation of how SES affects the lifestyle choices (diet and exercise habits) of South Asians. For example, it is unknown from these research studies why South Asians of higher SES (i.e., higher educational attainment and high household wealth) adopt unhealthy lifestyle choices in developing countries but adopt healthier lifestyles in developed countries. Research studies on the relationship between migration and urbanization in relation to diabetes among South Asians may help to explain these findings. It is also unknown how SES may affect access to fruits and vegetables as well as access to green spaces, parks, and gyms to exercise. Lastly, SES can affect accessibility and affordability of transportation needed to access health care and the overall health-related behaviours of South Asians, but this is also not examined in depth in these research studies.

The studies that focused on the relationship between gender and diabetes among South Asians also did not provide an in-depth analysis of why or how lifestyle choices, specifically diet, is influenced by male and female gender roles and expectations. For example, male and female gender roles and expectations have been found to impose constraints on the dietary and exercise-related choices of South Asians leading to diabetes and its poor management. However, justifications and evidence as to why or how gender roles and expectations influence the lifestyle choices and health-related behaviours of South Asians is not discussed in depth. Therefore, how specific SDH such as SES and gender influence the lifestyle choices and health-related behaviours of South Asians who are at risk for diabetes or are diagnosed with diabetes remains mostly unexamined. Studies also need to explore how family social capital and family support are related to gender and influence the lifestyle behaviours of South Asians in Canada, leading to diabetes. It is not sufficient to demonstrate there is a relationship between SDH and the increased prevalence and risk of diabetes among South Asians, critical analysis should be conducted to demonstrate why this relationship exists.

The third gap identified across the literature was the lack of Canadian-based studies conducted among the South Asian population living with diabetes and at risk for diabetes. A substantial amount of the current studies that were retrieved for this major project were performed in South Asian countries such as India, Pakistan, Bangladesh as well as Europe, the

UK, and the US. Therefore, there are few research studies that address the importance of SDH and diabetes prevalence and risk among South Asians from a Canadian context.

The last gap identified in the literature was the lack of attention to the various South Asian groups and their shared similarities and differences in living with diabetes as well as the SDH that affect their risk and management related to diabetes and T2D. The South Asian community consists of multiple subgroups such as those belonging to Afghanistan, Sri Lanka, Nepal, Bhutan, and the Maldives in addition to India, Pakistan, and Bangladesh. Each group has its own diverse language, belief systems, cultural values, practices, as well as health behaviours. There are certain similarities and differences in cultural values, cultural food habits, and cultural meanings attached to South Asian foods and practices across these different South Asian groups. For example, Sri Lankans make up a large portion of the South Asian community in Canada. In fact, according to the 2016 Canadian Census, approximately 200,000 Sri Lankans are living in Canada, but they are underrepresented in the diabetes literature both globally and within Canada (Government of Canada, 2020). This lack of inclusion is a gap because SDH such as culture can have a differential impact on diabetes risk and management due to the cultural differences in habits, foods, and values among South Asian subgroups. For example, Sri Lankans may consume different cultural foods that have different values and meanings in comparison to Indians. Therefore, the experiences of Sri Lankans in preventing and managing diabetes can be different from that of Indians.

In section 3.3 below, the major strengths and limitations of this major project will be provided.

3.3 – Strengths and Limitations of the Major Project

One of the key strengths of this major project was the adoption of the SDH approach to understanding why South Asians have a higher prevalence and risk for diabetes. Utilizing a SDH approach to frame this project allowed for a comprehensive understanding of the high prevalence and risk of diabetes among South Asians by exploring how the living and working conditions of South Asians is related to diabetes and its management. This is a significant strength as a SDH approach allows individuals to understand the bigger picture of how non-biomedical and non-behavioural factors influence diabetes risk and incidence, as well as the lifestyle choices linked to diabetes as opposed to blaming the individual for their poor health.

The second major strength of this major project was that despite a lack of scholarly research that addresses the research question, research studies performed with other visible minority and ethnic groups were utilized to support and critically examine important findings. Furthermore, grey literature was also utilized which allowed for a critical analysis into the research question and provided an additional view of how SDH influence the diabetes outcomes of South Asians in Canada as well as the lifestyle habits that put South Asians at risk for developing diabetes in the first place.

The third major strength of this major project was that given the paucity of studies that address the research question under study, I also utilized my personal experiences to analyze important findings from the literature review and provide further support. I would like to reiterate here again that I am one individual belonging to the South Asian ethnicity. and my experiences do not represent those of all South Asians. However, I do have personal experiences with family members and friends who have diabetes. I have heard stories of how SDH affected my families and friends' experiences of diabetes as well as personally witnessed them struggle to manage their T2D due to their living and working conditions. Thus, my knowledge around the relationship between SDH and the increased prevalence and risk of diabetes among South Asians in Canada was included within the discussion of this major project to bring meaning and clarity to the findings of the literature review.

In addition to the strengths of this major project, a major limitation was the lack of available research and data on SDH and diabetes among South Asians in Canada as well as other developing and developed countries. Therefore, further research is needed on this topic.

The next chapter will conclude the major project and outline recommendations to potentially contribute to the reduction of the high prevalence and risk of diabetes among South Asians in Canada.

Chapter 4- Conclusion and Recommendations

The aim of this major project was to identify the SDH related to the increased prevalence and risk of diabetes among South Asians in Canada to better understand how to reduce the high prevalence and risk of diabetes among South Asians in Canada – a group most vulnerable to diabetes, specifically T2D. To tackle the growing diabetes burden among South Asians in Canada, recommendations will be made in research, policy, as well as health care and practice.

4.1 – Recommendations for Research

As stated in the discussion, there is a paucity of research studies that address the research question of this major project. Among the few studies that address the SDH related to the increased prevalence and risk of diabetes among South Asians, there is a lack of critical analysis of why or how each key SDH (i.e., SES, migration, preserving culture through food, and gender) affects the lifestyle choices (diet and exercise) and health behaviours of South Asians and impact diabetes risk and management. Thus, the first recommendation is that more research studies be performed that utilize a SDH framework to understand the relationship between the increased prevalence and risk of diabetes among South Asians and their living and working conditions (i.e., SDH). As highlighted in this major project, SES, migration, preserving culture through food, and gender were the key SDH found to be related to the increased prevalence and risk of diabetes among South Asians. Thus, biomedical, and behavioural risk factors alone do not play a role in the development of diabetes among South Asians. It is integral that research goes beyond the dominant biomedical and behavioural model of health. Research is needed to explore how each of these SDH impact the economic, physical, and social environment of South Asians, leading to a higher prevalence and risk for diabetes among South Asians compared to the rest of the Canadian population. Other variables to consider are the effects of urbanization and family social capital and family social support in relation to the aforementioned SDH and how they impact the risk and prevalence of T2D among South Asians in Canada.

Specifically, there are very few studies conducted that investigate the finding that male and female gender roles/expectations is related to the increased prevalence and risk for diabetes among South Asians. Thus, research needs to focus on the influence that gender has on diabetes risk and its management. Research should not be limited to binary male and female gender roles and expectations and their influence on lifestyle choices (diet and exercise habits). It is necessary

to investigate how the roles and expectations placed on all gender identities, including transgender and gender queer, influence the prevalence and risk of diabetes among South Asians.

Another important recommendation to tackle the diabetes burden among South Asians in Canada is for Canadian-based research studies to be conducted that examine the relationship between SDH and the increased prevalence and risk of diabetes among South Asians. The rate of diabetes among South Asians in Canada is high. Given this, the current limited research that utilizes a SDH framework to address this issue within a Canadian context is surprising. Studies from South Asian countries, the UK, and Europe are useful in demonstrating that South Asians have higher rates of diabetes compared to the general population, and that the higher rates are due to SDH such as educational attainment, household wealth, migration, preserving culture through food, and gender. However, Canadian-based research studies are needed. In addition, research that examines the similarities and differences in how experiences of living with diabetes in Canada are affected by SDH across the various South Asian groups originating from Afghanistan, Sri Lanka, Nepal, Bhutan, Maldives, India, Pakistan, and Bangladesh is critical. By ensuring that the diversity of South Asian groups in Canada are represented in relation to the research question of this major project, the differences in diabetes rates within the South Asian community itself can be better understood leading to the development of culturally tailored diabetes prevention and management strategies.

4.2 – Recommendations for Policy

Recommendations to be implemented within policy are necessary to reduce the diabetes burden among South Asians in Canada. For decades, Diabetes Canada, a registered national charity that provides education, resources, services, and research related to diabetes had been advocating for a national diabetes policy in Canada. Their recommendations for a national diabetes policy for Canada was finally considered by the Canadian government in June 2021 when *Bill C-237, National Framework for Diabetes Act* was passed by the Senate (Diabetes Canada, 2021). This national diabetes policy has not been developed or finalized yet; thus, its goals and aims remain largely unknown (Diabetes Canada, 2021). Before its implementation, a recommendation is to ensure that the national diabetes policy is framed by the SDH framework and is culturally appropriate. Canada is a nation that is diverse and consists of a variety of ethnic and cultural groups (Government of Canada, 2015). Diabetes rates continue to remain the highest

among South Asians in Canada, as well as other visible minority groups, whether Canadian-born or immigrants, when compared to the general population (Sohal, 2008). Thus, this new national diabetes policy needs to aim at reducing the rates of diabetes among all ethnic minority groups by implementing culturally tailored goals and solutions for diabetes prevention and management in Canada.

Developing and living with diabetes and the distribution of SDH that influence diabetes outcomes such as SES, migration, preservation of culture through food, and gender differs across the diverse cultural groups that exist in Canada. More needs to be done to tackle the diabetes burden among South Asians in Canada. This can only be done by addressing health inequalities through the SDH framework as opposed to solely the biomedical and behavioural model of health as well as current behavioral strategies such as weight loss, diet, and physical activity. To reduce the diabetes rates among South Asians in Canada, it takes more than the adoption of healthy dietary choices and increased physical activity. The living and working conditions in which South Asians are born, live, grow, and age affect their ability to adopt healthy lifestyles and access health care. A high-income, good-quality employment conditions, access to healthy foods in neighbourhoods, access to green space and parks, and transportation to utilize health care services are critical needs for diabetes prevention and management. *Bill C-237* states that the national diabetes policy that will be effective next year plans to focus on health inequalities by considering existing diabetes prevention and treatment frameworks (Parliament of Canada, 2021). However, the goals and initiatives of the national diabetes policy must align with the SDH framework and explicitly target living and working conditions, employment and work opportunities, availability and access to transportation, and food security among other factors that affect diabetes outcomes.

Another policy level recommendation to reduce the high rates of diabetes among South Asians Canada is for the Canadian Food Policy Advisory Council to review and reassess current policy measures that are in place to ensure equitable access to food. The Canadian Food Policy Advisory Council was created by the Canadian federal government to report to the Minister of Agriculture and Agri-Food on food-related issues such as access to healthy food and food security among Canadians (Government of Canada, 2021). *The Food Policy for Canada* implemented in 2019 by Agriculture and Agri-Food Canada was employed to secure government funding to reduce food insecurity, improve food environments, and support healthier food

choices (Government of Canada, 2020). Despite this policy effort, South Asians in Canada who belong to a lower SES as well as other visible minority groups may be compromised in their access to affordable healthy foods in comparison to those of higher SES. As indicated in the literature review, increased fruit and vegetable consumption are known to reduce the risk to better manage diabetes (Ali et al., 2016). However, 38.4% of low-income Canadian families reported that they experienced some form of food insecurity. Furthermore, immigrants were found to be at highest risk for food insecurity (Dietitians of Canada. 2016). Thus, policy measures need to meet the long-term goal of providing equal access and availability to essential resources for low SES ethnic minority groups in Canada such as South Asians. This can be accomplished with the help of the Canadian Food Policy Advisory Council advocating and working towards increasing community-based food centers, as well as the establishment of more grocery stores and farmers markets within low-income neighbourhoods.

The last policy recommendation to tackle the diabetes burden among South Asians in Canada is to re-explore Canada's current immigration policy to assess whether the policy meets the core value of bringing skilled workers into Canada to support the economy. Canada's immigration policy aims to accept skilled immigrants from overseas with both educational and professional qualifications (Brousseau, 2020). However, as indicated in the literature review, a large portion of skilled immigrants who migrate to a Westernized country, such as Canada, experience underemployment, having to work in manual labour, restaurants, or shops as their educational and professional qualifications are not recognized in the host country. The Canadian labour market expects skilled immigrants to have "Canadian work experience" to work in skilled jobs and specialized fields such as health care. This mandate results in difficulties in finding jobs in fields that they have trained in and were qualified for among many immigrants (Brousseau, 2020). Thus, a recommendation is to make foreign credential recognition a key aim of the immigration policy in Canada. This can be done through working with professional regulatory bodies and educational bodies for each job sector to provide affordable accelerated vocational training that focuses on the skills and knowledge needed for the job. The implementation of this recommendation will provide opportunities to South Asians working in areas such as manual labour to earn a higher income to support a healthy lifestyle and prevent diabetes. Furthermore, South Asians arriving in Canada with foreign credentials can avoid having to restart their

educational journey again and instead participate in accelerated programs and training that advance their skills to meet the Canadian labour market.

4.3 – Recommendations for Health Care and Practice

To reduce the high rates of diabetes prevalence and risk among South Asians in Canada, it is also important that recommendations are made for all areas of the health care sector including practice by health care professionals, ranging from doctors, nurses, nutritionists, and dietitians among others. Canada is a nation that is one of the most multicultural countries and has a large South Asian population. Health care professionals may face challenges in providing appropriate diabetes education, care, and treatment to South Asians who seek help to prevent or manage diabetes. The challenges experienced can be the result of language barriers, life circumstances of South Asians that health care professionals do not understand, and cultural differences leading to cultural insensitivity. Thus, cultural competency training and the inclusion of health care professionals familiar with the South Asian culture and language within a variety of health care settings is essential. Thus, it is recommended that educational regulatory bodies such as the Canadian Medical Association and College of Dietitians of Ontario among others, as well as educational institutions, collaborate with health care institutions to provide accelerated training and certifications on cultural competency and cultural safety and their importance. These types of training programs need to be made available for all health care professionals but especially for health professionals such as nutritionists, registered nurses, and dietitians who work with people living with or at risk of developing diabetics. Through these educational programs and training, current and future health care professionals need to be taught the cultural beliefs, values, and practices that ethnic minority groups such as South Asians hold regarding cultural foods and physical activity that influence their lifestyle choices and health-related behaviours leading to their diabetes. This knowledge must then be implemented into the daily practice of health care professionals. Additionally, healthcare providers should conduct a cultural assessment on all patients to assess their cultural beliefs, practices, and values to determine how these affect patients/clients' behaviors in following and applying health education to their condition or disease. A better understanding of South Asian culture can result in more optimal care provided by health care professionals to their South Asian patients while enhancing their patients comfort and trust.

Another recommendation for health care is the inclusion of accelerated education and training programs for all health care professionals that allow for the increased competency in providing gender-appropriate diabetes care to South Asians in Canada. Like cultural competency education and training, health care professionals need to learn the importance of the ways in which gender roles and expectations can influence the lifestyle choices and health-related behaviours of ethnic minority groups such as South Asians. It is essential that health care professionals across all disciplines, including nurses, doctors, nutritionists, dieticians, or lifestyle therapists, possess the ability to recognize and utilize their understanding of gender roles and expectations when providing care to South Asians but also other ethnic minority groups in Canada who seek diabetes care. Thus, educational institutions need to collaborate with professional health regulatory bodies and health care institutions to include gender and its influence on health as a focal point in education and training. This will allow all health care professionals to enhance their knowledge on how they can provide gender-appropriate treatment and care for ethnic minority groups such as South Asians living with diabetes.

To conclude, to alleviate the diabetes burden among South Asians in Canada, the importance of SDH approaches must be implemented and not solely the dominant biomedical and behavioural models of health that prevail in contemporary Canadian health care. There needs to be increased awareness that biology and medication are useful but are not the only solution to diabetes prevention and management. Diabetes can be prevented or better managed among South Asians by addressing the social, economic, political, and cultural factors that influence diabetes risk, incidence, and its management. Through this major project, the message needs to be sent to researchers, policymakers, health care professionals and other stakeholders that more research and policy efforts that utilize a SDH approach are needed to target the high prevalence and risk of diabetes among South Asians in Canada. This includes targeting accessibility, availability, and affordability to healthy foods such as fruits and vegetables, green spaces and recreational spaces and ensuring opportunities for higher-incomes and appropriate employment, and access to health care in policy measures. Furthermore, health care professionals, educational institutions, and all health-related professional regulatory bodies need to understand, promote, and practice the importance of cultural competency and gender-appropriate care when providing diabetes care to South Asians in Canada. This will result in culturally tailored and gender-appropriate diabetes

interventions as well as management strategies for South Asians in Canada to prevent and manage diabetes.

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