MAKING THE SHIFT FROM UNKNOWING TO KNOWING AND LIVING WITH ONE'S RISK FOR CORONARY ARTERY DISEASE AFTER HAVING HAD GESTATIONAL DIABETES MELLITUS: A GROUNDED THEORY STUDY

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Abstract

Background: Coronary artery disease (CAD) is a growing cardiovascular issue for women under the age of 55, resulting in poor health outcomes, including mortality. The literature has identified that women possess both traditional and pregnancy-related non-traditional risk factors for CAD. Gestational diabetes mellitus (GDM) is one such risk factor that is on the rise, causing a fourfold increased risk for CAD. Although the connection between the risk of CAD following GDM exists, it remains unclear if, and from whom, when, and how women acquire their knowledge of this risk. It is also uncertain how they come to understand and manage this risk. Furthermore, specific follow-ups for the development of CAD after GDM are not being conducted. We need a clearer understanding of how these women come to know, understand, assign meaning to, manage, and live with this risk before education, screening, and interventions can be developed.

Purpose: The purpose of this grounded theory (GT) study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being.

Methods: This research study was guided by a GT approach. Semi-structured interviews were conducted on women who had GDM and lived in Newfoundland and Labrador (NL). The constant comparative method was used to facilitate data collection and analysis.

Results: There were 26 women from NL with a history of GDM who participated in the study. The substantive theory that emerged from the data was *Making the Shift from Unknowing to Knowing and Living with One's Risk for CAD After Having had a Diagnosis of GDM*. This substantive theory emerged from three theoretical constructs: 1) Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM, 2) Knowing One's Risk for CAD Following a Diagnosis of GDM, and 3) Living With One's Risk for CAD Following a Diagnosis of GDM. The findings of the first theoretical construct indicate that women were not informed about their risk for CAD after GDM during their GDM diagnosis or after their pregnancy. The findings of the second theoretical construct reveal that the participants did not know they were at risk for CAD after receiving a diagnosis of GDM. The third theoretical construct identifies the barriers and motivators associated with implementing lifestyle and behavioural changes in individuals living with the risk of CAD following a GDM diagnosis. It highlights the need for clinical practice guidelines and follow-up for this cohort.

Conclusions: Women living in NL require better education about CAD risk from healthcare professionals (HCPs), who in turn need training to communicate this information effectively. Therefore, improved risk communication by HCPs is crucial. Specific clinical guidelines and screenings should be created for this group to mitigate CAD risk. Additionally, a dedicated women's health center should adopt a sex-and-gender focus with an interdisciplinary team for those with GDM and other risk factors for CAD. Nurses can serve as navigators and educators in this team, ensuring that women's healthcare experiences are recognized.

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CAD	Coronary artery disease
CI	Confidence Interval
CVD	Cardiovascular disease
CWHHA	Canadian Women's Heart Health Alliance
GDM	Gestational diabetes mellitus
GTT	Glucose Tolerance Test
HCP	Healthcare professional
HREB	Health Research Ethics Board
JBI	Johanna Briggs Institute
MI	Myocardial infarction
N	Number of participants
NL	Newfoundland and Labrador
PHAC	Public Health Agency of Canada
PI	Primary investigator
PSA	Public service announcement
SEED	Scholarships and Education Exchanges for Development

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Chapter 1: Introduction to the Dissertation

Coronary artery disease (CAD) is a significant global health concern and the most common cardiovascular disease (CVD), affecting 315 million people worldwide (Khan et al., 2020; Roth et al., 2017; Virani et al., 2021). CAD occurs due to plaque buildup on arterial walls, leading to insufficient blood flow and reduced myocardial oxygen supply (Garcia et al., 2016). It can result in angina, myocardial infarction (MI), and heart failure (Centers for Disease Control and Prevention, 2019; Garcia et al., 2016). In Canada, the number of individuals diagnosed with CAD has increased from 1.5 million in 2001 to 2.4 million in 2018 (Public Health Agency of Canada, 2018). The prevalence rate is projected to rise by 0.19% by 2030 (Khan et al., 2020). In addition to elevated prevalence rates, CAD remains the leading cause of mortality worldwide and the second leading cause of death in Canada (Jaffer et al., 2021; Public Health Agency of Canada, 2019; Shahjahan et al., 2025).

The province of Newfoundland and Labrador (NL) has a higher prevalence rate of CAD at 8% compared to other provinces in Canada (Orzel et al., 2021). Additionally, the province has a high incidence of MIs at 2.6%, which exceeds the national average of 2.0% (Health Accord NL, 2022; Public Health Agency of Canada, 2018). Those living in NL also exhibit elevated mortality rates from CAD compared to the rest of Canadians (Health Accord NL, 2022; Public Health Agency of Canada, 2018). Specifically, the province's mortality rate attributable to CAD was recorded as the highest in Canada, amounting to 274.3 deaths per 100,000 population. This figure significantly exceeds the national average of 192.6 deaths per 100,000 population (Orzel et al., 2021). The significant prevalence, incidence, and high mortality rates underscore the necessity of addressing CAD mitigation as a priority at all levels of health, including provincial, national, and global.

CAD has traditionally been considered a male-dominant condition; however, this is not the case. In Canada, a woman succumbs to CAD every 16 minutes (Heart and Stroke Foundation of Canada, 2023; Norris & Mulvagh, 2024). Over the past 10 years, CAD diagnoses and hospitalizations in women under the age of 55 have been increasing across the nation (Arora et al., 2019; Botly et al., 2020; Colella et al., 2021; Jaffer et al., 2021; Norris et al., 2020). Women under the age of 55 also experience poorer health outcomes associated with CAD, including psychosocial issues such as depression and anxiety, as well as higher mortality rates after an MI compared to men (Alyasin et al., 2021; Arora et al., 2019; Botly et al., 2020; Colella et al., 2021; Garcia et al., 2016; Jaffer et al., 2021; Mattina et al., 2019; Mehta et al., 2016; Norris et al., 2020). Noteworthy, is that women tend to develop CAD 10 years later than men (Khan et al., 2020; Pacheco et al., 2021; Public Health Agency of Canada, 2018). This has contributed to gaps in knowledge and clinical care in younger women at risk for CAD (Arora et al., 2019). Nonetheless, CAD is increasing in this cohort and is recognized as the primary contributor to premature mortality among women both globally and nationally. To address contributing factors to increase prevalence and mortality rates, we must understand the sex-specific nature of CAD.

There exist both traditional (e.g., smoking, obesity, etc.) and pregnancy-related risks, which are regarded as non-traditional risk factors (e.g., gestational diabetes mellitus (GDM), preeclampsia, etc.), contributing to the development of CAD. The prevalence of GDM is increasing globally and represents a larger risk for future CAD in women, in comparison to other non-traditional risk factors (Garcia et al., 2016). In a systematic review and meta-analysis conducted by Behboudi-Gandevani et al. (2019), it was determined that the global prevalence of GDM was 10.6% (95% CI [10.5-10.6%]) among pregnant women. Conversely, a more recent review by Wang et al. (2022) identified the global prevalence of GDM to be 14.4% (95% CI [13.97-14.04%]). Women with GDM have a fourfold higher risk of developing an MI in comparison to women who did not have GDM (Garcia et al., 2016). Therefore, it is imperative to focus on strategies to reduce the risk of developing CAD in women with GDM, due to the poor outcomes that result from CAD. Limited research exists on GDM and CAD, beyond the empirical evidence supporting this link. Before developing interventions to help mitigate CAD development, we need a better understanding of how women come to know, understand, assign meaning to, manage, and live with their risk for the subsequent development of CAD (Glaser & Strauss, 1967). This approach will ensure that any interventions are realistic and reflect the context of women's everyday lives and experiences.

From the existing literature, we know that women have limited knowledge of GDM and its related health risks (e.g., type 2 diabetes, CAD) post-GDM. This lack of knowledge is primarily attributed to women's interactions and relationships with healthcare professionals (HCPs), dissatisfaction with the information received from HCPs, and the paucity of education provided by HCPs (Craig et al., 2020; Khooshehchin et al., 2016; Lawrence et al., 2019; Lennon, 2018; Sandsaeter et al., 2019). Additionally, it remains unclear from whom women acquire their knowledge about the risk of CAD after a diagnosis of GDM (e.g., nurses, obstetricians, family doctors, nurse practitioners, social media, family, friends, etc.), when they receive education regarding this risk (e.g., during pregnancy, postpartum, in the delivery room, etc.), and how they obtain this knowledge (e.g., verbally, through pamphlets, in one-on-one meetings, etc.). This information is crucial for developing effective interventions.

Evidence about women's understanding of their risk for CAD after GDM is also limited, including their awareness of CAD risk and their associated psychosocial and behavioural reactions (Andraweera et al., 2022; Beussink-Nelson et al., 2022; Ghisi et al., 2024). Evidence also indicates that women who do not have an accurate assessment of their risk for CAD encounter challenges in executing requisite behaviour change, such as lifestyle adjustments, during and after GDM (Larrabure-Torrealva et al., 2018; Lee et al., 2018; Li et al., 2020; Nerenberg et al., 2014). Healthy lifestyle habits are essential not only for the well-being of the mother and fetus during pregnancy, but also into the postpartum period and beyond, to avert future risks of type 2 diabetes and CAD. Nevertheless, our understanding of how women manage the risk of CAD is limited; it remains uncertain whether they would implement behavioural changes or alterations in general if they were aware of their risk for CAD after GDM. The experience of living with the risk for CAD warrants further investigation to facilitate a deeper understanding of how women navigate the associated risk following GDM and the various factors involved.

The existing literature on risk shows that risk perception is influenced and redefined by an individual's subjective experiences, societal interactions with various entities (e.g., HCPs and family), encounters with social objects (e.g., social media), and objective data (e.g., test results) (Ferrer et al., 2015; Krimsky & Golding, 1992; Lupton, 1999; Lupton, 2013; Manuel, 2015). Furthermore, individuals' healthcare decisions are often based on their personal assessments of risk (Lim et al., 2022; Montori et al., 2022). Consequently, it is essential to understand how this population perceives their risk and the factors that influence their overall perception of CAD risk. This insight can facilitate the development of interventions tailored to meet the unique needs of this cohort.

Finally, evidence demonstrates that the follow-up for CAD after GDM is not conducted systematically. In NL, there is a deficiency of standardized clinical practice guidelines regarding screening and educational follow-up for this high-risk demographic (Diabetes Canada, 2018). The fact that postpartum screening for GDM mainly focuses on the detection of type 2 diabetes is concerning. Even though GDM may resolve post-pregnancy, it continues to present a risk for the development of CAD, regardless of whether the individual subsequently develops type 2 diabetes (Craig et al., 2020; Martis et al., 2018). Further exacerbating the issue of inadequate follow-up is the lack of specific clinical practice guidelines that would facilitate screening, education, and treatment for women at risk of CAD following a GDM diagnosis. The recommendations issued by Diabetes Canada (2018) emphasize the importance of postpartum follow-up for women with GDM regarding the risk of type 2 diabetes; however, they do not provide detailed guidance regarding CAD. While both the United States and Canada have formulated generalized recommendations for follow-up aimed at reducing the incidence of CAD among women with GDM (Graves et al., 2019; Jasper & Skelding, 2018; Mehta et al., 2016; Poola-Kella et al., 2018; Srivaratharajah & Abramson, 2019), the execution of these recommendations has been ineffective. Furthermore, the Diabetes Canada guidelines fail to stipulate the appropriate timing for screening and assessing women with

GDM for CAD or to clarify the components that such screening and assessment should encompass (Diabetes Canada, 2018; Diabetes Canada, 2021; Berger et al., 2019).

The purpose of this grounded theory (GT) study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This includes how women come to know that they are at risk for CAD, how they understand this risk, assign meaning to it, how they manage this risk, and how they live with the risk of CAD. In analyzing the concept of risk for CAD after GDM, the research team recognizes the invaluable contributions of other significant scholars, including social theorists such as Lupton (2013), who assert that risk is constructed not solely through objectivity or statistical measures, but also through one's social interactions, beliefs, and experiences regarding the phenomenon at hand.

This dissertation research was a GT study using the Glasarian (1967) approach to gain a fuller understanding of the psychosocial process of being diagnosed with GDM and subsequently living with the risk for or developing CAD. Exploring a psychosocial process involves examining patterns of behaviours and actions that lead to a phenomenon (Glaser & Strauss, 1967). This includes how a person comes to know, understand, assign meaning to, manage, and live with the phenomenon. GT is an appropriate methodological approach because it aims to discover and understand a psychosocial process as it unfolds (Glaser, 1978; Glaser, 2005; Glaser & Strauss, 1967). Using GT, the researchers may gain a deeper understanding of this process, as it is grounded in the participants' voices and contextualized within the nexus of their social relationships (Glaser & Strauss, 1967). As such, the findings and recommendations reflect the health needs of study participants. The findings from this research may also have the potential to inform policy and guidelines surrounding GDM and CAD in the province of NL.

The substantive theory identified was *Making the Shift from Unknowing to Knowing and Living with One's Risk for CAD After Having had GDM.* A typical pattern throughout the theory was how women come to perceive their risk for CAD after having had a diagnosis of GDM. The Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines were employed to document aspects of the research process, including methods, study context, findings, analysis, and discussion in the study (Tong et al., 2007). In this chapter, the literature about CAD and GDM will be discussed. This chapter will also provide an overview of the study's methods and outline the remaining chapters of this dissertation. Each dissertation chapter is designed to be self-contained with a designated reference list.

Methods of the Literature Search

To conduct the literature review, the databases CINAHL, PubMed, Medline, and the Cochrane Library were searched. Multiple searches were conducted to include incidence, patient and health care experiences, prevalence, risk factors, knowledge, education, and interventional studies on GDM and CAD. Key terms and MESH terms used during the search included gestational diabetes mellitus, gestational diabetes, coronary arteriosclerosis, coronary artery disease, risk factor, incidence, prevalence, patient education, patient/women's knowledge/experiences, HCPs' knowledge/experiences, and educational program. Studies were primarily limited to those available in English and conducted in the last 20 years. Qualitative research, quantitative research, systematic reviews, and meta-analyses were included in the literature search. Once articles were retrieved, the reference lists were also searched for articles not in the databases. Google was used as a grey literature source to explore websites such as the Canadian Diabetes Association, the Heart and Stroke Foundation, and the Canadian Women's Heart Health Alliance.

The studies included in the literature review were primarily conducted in the Western World and are generalizable to women in Canada. Qualitative studies included in the review were critically appraised using the Joanna Briggs Institute (JBI) Critical Appraisal Toolkit (Lockwood et al., 2015). Quantitative studies included in the literature review were critically appraised using the Public Health Agency of Canada (PHAC) Critical Appraisal Toolkit (2014). All quantitative studies, systematic reviews, and meta-analyses included in the literature review were of medium to high quality, as assessed using the PHAC Critical Appraisal Toolkit (PHAC, 2014). The qualitative studies included in the literature review were of medium to strong quality, as evaluated by the JBI Critical Appraisal Toolkit, in terms of research design, methods, and conclusions (Lockwood et al., 2015). Based on these appraisals, the qualitative literature also provides good support for insight into women's experiences with GDM and CAD.

Overview of Chapter 1

The literature review will commence with a background on CAD in women, including the pathophysiology, incidence and prevalence, the implications of the disease, the contributing factors, and the social construction of CAD. Subsequently, a thorough background on GDM as a non-traditional risk factor for CAD will be provided, including a comprehensive examination of its pathophysiology, diagnosis, and presentation, as well as its prevalence and incidence, implications, and issues related to managing GDM during pregnancy and into the postpartum period. The existing qualitative, quantitative, and mixed-methods research will be intricately interwoven throughout these discussions. An exploration of the gaps in the literature about GDM and CAD will follow, along with articulating the problem statement, research purpose, and questions. Thereafter, an overview of the research study will be presented, detailing the selected methodology and study methods, followed by an outline of the upcoming chapters and findings.

Background on CAD

This section will begin by outlining the pathophysiology and presentation of CAD. It will then discuss the incidence and prevalence of CAD and its implications as indicators of the disease burden on women. The contributing factors related to CAD risk will be examined, including how CAD has been socially constructed.

Pathophysiology and Presentation of CAD

CVD is a chronic condition that is identified as the primary cause of mortality worldwide, accounting for one-third of all global fatalities and exhibiting an upward trend over the past three decades (Di Cesare et al., 2024; Heart and Stroke Foundation of Canada, 2018; Vaduganathan et al., 2022; World Health Organization [WHO], 2025). CVD encompasses a range of heart and vascular diseases (American Heart Association, 2019; WHO, 2025). The WHO (2025) classifies seven specific conditions under the umbrella of CVD, which are as follows: 1) CAD, 2) cerebrovascular disease, 3) peripheral arterial disease, 4) rheumatic heart disease, 5) congenital heart disease, 6) deep vein thrombosis, and 7) heart failure. Among these conditions, CAD is the most prevalent and ranks as a leading non-communicable disease globally (Kaptoge, 2019; WHO, 2025).

CAD is characterized by the accumulation of plaque within the arterial walls. This pathological process may lead to impaired blood circulation and reduced oxygen delivery to the myocardium, ultimately contributing to various cardiac complications, including angina, MI, and heart failure (Frak et al., 2022; Garcia et al., 2016; Shahjehan et al., 2024). Women are more susceptible to diffuse plaque accumulation and are likely to experience a higher prevalence of microvascular disease, or disease affecting the smaller blood vessels, when compared to men, who predominantly exhibit obstructive plaque accumulation in the larger arteries (Kornowski et al., 1997; Schamroth Pravda et al., 2021).

Chest pain is a common warning symptom that may indicate the onset of an MI or CAD, affecting both men and women (Ferry et al., 2019; Kreatsoulas et al., 2013; Schulte & Mayrovitz, 2023). For instance, a high-quality cross-sectional study conducted by Ferry et al. (2019) revealed that both genders experience chest pain. Based on a sample of 1,941 individuals from the United Kingdom presenting with MI, 91% of men and 92% of women reported experiencing chest pain (Ferry et al., 2019). Furthermore, recent high-quality studies suggested that women are more likely to encounter angina as an initial sign of CAD than to experience an acute MI (Khan et al., 2020; Norris et al., 2020; Pacheco et al., 2021). A review by Pacheco et al. (2021) emphasized that women are more likely to report angina on first presentation of CAD compared to men (47% versus 32%), but less likely to have an acute MI (32% versus 46%) as their first sign.

While both women and men may experience chest pain as a precursor to an MI, literature indicates that women may also present with other additional symptoms (Alraies & Pina, 2019; Ferry et al., 2019; Joseph et al., 2021; Madonis et al., 2017; Mehta et al., 2016; Norris et al., 2020). These other symptoms in women encompass belching, upper back pain, pain in the arm, neck, and jaw, unusual fatigue and sweating, feelings of anxiety or fear, nausea and vomiting, palpitations, weakness, and flu-like symptoms (Alraies & Pina, 2019; Devon et al., 2014; Madonis et al., 2017; Mehta et al., 2016; Pacheco et al., 2022). For example, a cross-sectional study conducted by Devon et al. (2014) in the United States revealed that women were 2.53 times more likely to experience shoulder pain compared to men (OR 2.53, 95% CI [1.29-4.96]) and 2.15 times more likely to experience arm pain than men (OR 2.15, 95% CI [1.10-4.20]). As a result, HCPs may experience challenges differentiating an MI from other medical conditions (Norris et al., 2020; Pepine et al., 2015). Consequently, HCPs must possess a comprehensive understanding that women's cardiovascular manifestations may differ when evaluating both typical and other symptoms of CAD in women (Ferry et al., 2019). Considering both assessments represent a significant advancement towards the early detection, management, and prevention of CAD in women (Ferry et al., 2019).

Incidence and Prevalence

The incidence, prevalence, outcomes, and implications related to CAD are indicators of the magnitude of the CAD burden in women, as well as whether intervention, policy, or guidelines are warranted. Several high-quality cross-sectional studies have found that CAD is a prominent issue worldwide (Khan et al., 2020; Roth et al., 2017; Virani et al., 2021) and is ranked as the most prevalent cardiovascular disease (Roth et al., 2017). According to a recent high-quality study by Khan et al. (2020), which analyzed epidemiological data on CAD from 1990 to 2017 from all countries and regions, approximately 126 million people, or 1,655 per 100,000 people, had CAD. Similar findings were also reported in other global studies (Roth et al., 2017; Virani et al., 2021). In women, the global prevalence of CAD was 1,522 cases per 100,000 women (Khan et al., 2020). The expected prevalence rate is also projected to rise by 0.19% by 2030 (Khan et al., 2020).

On a national level, the most recent results from the Canadian Chronic Disease Surveillance System (2024) reported that the number of people living with CAD in Canada is trending upward. Between 2000 and 2001, approximately 1.5 million Canadians were living with CAD. Between 2017 and 2018, it was reported that 2.4 million Canadians, or approximately 1 in 12 Canadians over the age of 20, live with CAD (Canadian Chronic Disease Surveillance System, 2014; Public Health Agency of Canada, 2016). The number of women being diagnosed with CAD has increased over time. The prevalence of diagnosed CAD among Canadian women ages 20 and over has increased from 5.7% in 2000 to 2001 to 6.3% in 2012 to 2013. During the same period, the occurrence of acute MI rose from 0.7% in 2000 to 2001 to 1.1% in 2012 to 2013 (Canadian Chronic Disease Surveillance System, 2024).

While there have been limited studies comparing the incidence and prevalence of CAD per province, the Atlantic provinces of Canada have been found to have higher rates of CAD in comparison to other parts of the country (Canadian Chronic Disease Surveillance System, 2024; Orzel et al., 2021; Public Health Agency of Canada, 2016). The province of NL has a high prevalence rate of CAD at 8% compared to other Canadian provinces, with the occurrence of MI exceeding the national average (2.6% in NL versus 2.0% in Canada) (Health Accord NL, 2022; Public Health Agency of Canada, 2018).

Women tend to develop CAD 10 years later than men (Khan et al., 2020; Pacheco et al., 2021; Public Health Agency of Canada, 2016). This has contributed to gaps in knowledge and clinical care in younger women at risk for CAD (Arora et al., 2019). Nonetheless, there is an upward trend in CAD development among women under the age of 55, and it is acknowledged as the leading factor in premature mortality among women both globally and nationally (Arora et al., 2019; Botly et al., 2020; Izadnegahdar et al. 2014, Jaffer et al., 2021; Mehta et al., 2016; Norris et al., 2020). Arora et al. (2019) conducted a high-quality retrospective cohort study in the United States with a sample of 8,737 young men and women admitted for acute MI, that revealed that the annual incidence of MI-related visits increased among women under the age of 55 while it decreased for young men ($p<0.0001$ versus $p = 0.1$). Likewise, Canada has experienced a shift in women under the age of 55 developing CAD (Botley et al., 2020; Jaffer et al., 2021).

Over the past 10 years, CAD diagnosis and hospitalizations in women under the age of 55 have increased (Arora et al., 2019; Botly et al., 2020; Colella et al., 2021; Jaffer et al., 2021; Norris et al., 2020). Botly et al. (2020) conducted an age- and sex-specific analysis of hospitalizations related to cardiovascular disease across Canadian provinces. The findings of the study highlighted that while there had been a significant decrease in hospitalizations for CAD among older women over the previous 10 years, women aged 20 to 39 were the only cohort that did not see a substantial reduction in the number hospitalized for CAD in that period (Botly et al., 2020).

The literature regarding incidence and prevalence indicates that CAD is a significant global, national, and provincial concern due to its high incidence and prevalence rates. CAD is a particular problem in NL, specifically because the province exhibits the highest rates of MI. Rates of CAD are rising among women on both global and national scales. Although it has been established that CAD typically manifests approximately 10 years later in women than in men, an increasing number of younger women under the age of 55 are being hospitalized due to CAD. This trend indicates that young women also present with and need medical care for CAD.

Disease Implications of CAD

To contextualize the significance of CAD, it is essential to understand the burden of CAD, including the potential implications for women diagnosed with CAD. The higher incidence and prevalence of CAD have several impacts. These include mortality, increased costs to the healthcare system/increased hospitalizations, and psychological effects (Jaffer et al., 2021). These impacts will be discussed below.

Mortality

Across the globe, CAD is responsible for approximately 9 million deaths annually (Khan et al., 2020; Virani et al., 2021). The most recent Canadian data from 2017 to 2018 indicates that the death rate for CAD was 2.9 times higher among adults aged 20 and over who have been diagnosed with CAD, in comparison to those without CAD (Canadian Chronic Disease Surveillance System, 2024). The death rate was also 4.6 times higher in adults aged 20 and over who had had an MI, versus those who had not (Canadian Chronic Disease Surveillance System, 2024). These findings indicate that CAD is a prominent issue in Canada.

Furthermore, a high-quality cross-sectional study by Orzel et al. (2021) used participant data from the Atlantic Partnership for Tomorrow's Health study from 2009 to

2015 to assess the association between physical activity and CVD events and the impacts across Canadian regions. They found that Atlantic Canadians had the lowest physical activity levels and poorest outcomes related to CAD (Orzel et al., 2021). Of the Atlantic provinces, NL had the highest mortality rates associated with CAD, with 274.3 deaths per 100,000 in comparison to 261 per 100,000 deaths in Nova Scotia, 255.1 deaths per 100,000 in Prince Edward Island, and 246.4 deaths per 100,000 in New Brunswick (Orzel et al., 2021). All rates of the Atlantic provinces were higher than the overall Canadian average of 192.6 deaths per 100,000 people (Orzel et al., 2021).

CAD is the leading cause of premature death of Canadian women in comparison to all other cancers combined, including breast, ovarian, and lung cancer (Colella et al., 2021; Heart and Stroke Foundation, 2023; Jaffer et al., 2021; Norris et al., 2020). Jaffer et al. (2021) published a recent review of the epidemiology of CVD in Canadian women as part of the Canadian Women's Heart Health Alliance Atlas. The review's findings highlighted that the highest mortality rates for CAD in women were observed in Prince Edward Island (20.6%), Alberta (19.8%), Saskatchewan (19.1%), and Newfoundland and Labrador (18.9%) (Jaffer et al., 2021). All of these were higher than the national mortality rate of 17.6% (Jaffer et al., 2021).

Younger women (under the age of 55) have poorer health outcomes related to CAD compared to men (Garcia et al., 2016; Jaffer et al., 2021; Maas & Appleman, 2010; Mehta et al., 2016; Norris et al., 2020). High-quality studies have explored sex differences in mortality after acute MI (Izadnegahdar et al., 2014; Jaffer et al., 2020; Mehta et al., 2016; Vaccarino et al., 2009). A Canadian review of women's heart disease highlights that women under the age of 55 are more likely to die in the first year following MI in comparison to men (Izadnegahdar et al., 2014; Jaffer et al., 2021). The review included a high-quality Canadian cross-sectional study by Izadnegahdar et al. (2014) that assessed trends in sex differences in acute MI and 30-day mortality rates from 2000 to 2009 in British Columbia. The researchers found that women under the age of 55 were 1.61 times more likely to die in comparison to men after experiencing a MI (OR 1.61, 95% CI [1.25, 2.08]).

In summary, younger women have a higher risk of death than men following an MI. Given that NL has the highest mortality rates related to CAD, and one of the highest mortality rates for women living with the disease specifically, preventive measures for CAD are warranted for women in this region of Canada.

Costs to the Healthcare System

CAD is associated with various costs to the healthcare system (Jaffer et al., 2021; Kaul et al., 2021; Smolderen et al., 2010; Tran et al., 2021). According to an analysis conducted by the Heart and Stroke Foundation utilizing data from the Canadian Institute of Health Information's National Ambulatory Care Reporting System, CAD represents the primary cause of emergency department visits for women across Canada (Heart and Stroke Foundation, 2018; Jaffer et al., 2021; Norris et al., 2020). For instance, CAD-related visits to the emergency department amounted to 31,910, in contrast to 25,969 visits for stroke and 19,110 visits for atrial fibrillation (Jaffer et al., 2021; Norris et al., 2020).

Costs associated with CAD have been attributed to hospitalizations. Several medium to high-quality studies have identified a correlation between CAD and increased hospitalizations (Jaffer et al., 2021; Kaul et al., 2021; Smolderen et al., 2010; Tran et al., 2021). For instance, a cohort study conducted in Alberta, Canada, by Kaul et al. (2021) identified CVD admissions as a significant cost factor impacting the healthcare system. This study examined the prevalence of CVD, including total healthcare costs among high-cost users with and without CVD, assessed the costs associated with other comorbidities among these high-cost users, and analyzed the trajectory of healthcare costs in the years preceding and following their categorization as high-cost users within the healthcare system (Kaul et al., 2021). The study's findings highlighted that, among the 88,536 high-cost users identified, 23.4% did not have CVD, 28.9% were admitted with a primary diagnosis of CVD, and 47.7% were hospitalized with a secondary diagnosis of CVD (Kaul et al., 2021). These results emphasize the necessity for interventions aimed at mitigating CVD and reducing the healthcare costs associated with this disease.

Psychosocial Impacts

More women under the age of 55 also experience psychosocial issues such as depression and anxiety compared to men (Alyasin et al., 2021; Colella et al., 2021; Gaffey et al., 2024; Garcia et al., 2016; Jaffer et al., 2021; Mattina et al., 2019; Mehta et al., 2016; Norris et al., 2020). An integrated literature review conducted by Alyasin et al. (2021) found that, based on the findings of 18 qualitative, quantitative, and mixed-methods studies, women experienced significant psychosocial effects on their lives after a diagnosis of CAD. These psychosocial effects include depression, fear, and anxiety. These psychosocial impacts will be discussed below.

Depression. Depression is cited in the literature as a typical psychosocial response among women diagnosed with CAD and linked to an elevated risk of recurrent CAD events (Barry et al., 2023; Dar et al., 2019; Ebong et al., 2024; Gaffey et al., 2024; Jaffer et al., 2021; Larsen et al., 2006; Mattina et al., 2019; Meijer et al., 2011; Moller-Leimkuhler et al., 2010; Rome et al., 2022; Senoo et al., 2024; Vaccarino et al., 2011). The findings from three high-quality studies have indicated that women are nearly twice as likely to develop depression following a diagnosis of a cardiac condition compared to men (Meijer et al., 2011; Moller-Leimkuhler et al., 2010; Senoo et al., 2024). Similarly, a meta-analysis conducted by Shanmugasegaram et al. (2012) reported that women are 1.77 times more likely to develop depression than men (OR 1.77, 95% CI [1.21-2.58]).

Adding to the fact that depression is a typical psychosocial response following a cardiac event in women, the findings of existing qualitative research of high trustworthiness showed that depression adversely affects both the mental and physical well-being of women diagnosed with CAD (Hebron & Juniper, 2021; Liljeroos et al., 2023; Rogerson et al., 2012; Westas et al., 2022). In a qualitative descriptive study by Liljeroos et al. (2023) participants with depression symptoms post-MI described how the disease changed their lives and overall outlook, such as the ability to engage in activities they once enjoyed. Similarly, a qualitative descriptive study conducted by Rogerson et al. (2012) revealed that participants diagnosed with CAD who exhibited depressive symptoms expressed negative perceptions of their health and low mood, which served as barriers to the implementation of healthy lifestyle changes aimed at preventing future CAD events. For example, participants described their low mood as a factor in not wanting to get out of bed, exercise, or engage in activities in general (Rogerson et al., 2012).

Women diagnosed with depression are also at an elevated risk of having recurrent cardiac events (Gaffey et al., 2024; Rome et al., 2022; Senoo et al., 2024; Shah et al., 2014). A high-quality cohort study conducted by Shah et al. (2014) examined 3,237 participants to determine whether depression in young women (under the age of 55), correlated with a heightened risk of CAD events and mortality when compared to similarly aged men (under the age of 55), and older women (over the age of 55). The results indicated that younger women with depression had a 1.07 increased likelihood of experiencing a higher risk of mortality relative to their similarly aged male counterparts and older women (HR=1.07, 95% CI, 1.02-1.14). Additionally, a recent comprehensive cohort study by Senoo et al. (2024) demonstrated a significant association between depression and subsequent cardiac events in both men and women, but with a notably stronger correlation observed in women (HR 1.64, 95% CI: 1.59-1.70 in women versus HR 1.39, 95% CI: 1.35-1.42 in men).

Other Psychosocial Impacts. Existing research evidence indicated that women diagnosed with CAD experience various psychological impacts upon diagnosis, including fear, anxiety, and feelings of isolation (Alyasin et al., 2021; Junehag et al., 2014; Kazimiera Andersson et al., 2013; Marcuccino et al., 2003). An integrative literature review conducted by Alyasin et al. (2021), two qualitative descriptive studies of high trustworthiness by Gooding et al. (2021) and Junehag et al. (2014), two phenomenological studies of high trustworthiness by Kazimiera Andersson et al. (2013) and Qin et al. (2022), and a cross-sectional study of medium quality by Marcuccino et al. (2003), all examined women’s perceptions following a CAD diagnosis. A prevailing theme within this literature was that a diagnosis of CAD resulted in a sense of shock or surprise, as well as significant fear and anxiety.

The literature showed that women have experienced a sense of shock or surprise when being diagnosed with CAD (Gooding et al., 2021; Marcuccino et al., 2003). For example, Marcuccino et al. (2003) found that participants perceived the diagnosis of CAD as unexpected, likely due to a common misconception that the condition predominantly affects men. Similar findings resulted from the qualitative descriptive study by Gooding et al. (2021) when women expressed surprise at discovering that heart disease is a leading cause of death in women. Participants indicated that they generally hear about more men being diagnosed with the disease than women, and therefore, the news was unexpected (Gooding et al., 2021).

Fear and anxiety were also significant outcomes among women diagnosed with CAD (Alyasin et al., 2021; Junehag et al., 2014; Kazimiera Andersson et al., 2013). For instance, individuals in the qualitative study by Junehag et al. (2014) expressed anxiety associated with the potential of experiencing a MI or other cardiac event again in the future. These feelings of anxiety led these women to keep a phone at their bedside or want to be near a healthcare facility, just in case a cardiac issue arose. Some women went to bed early to stop thinking about this fear and relieve the anxiety they were experiencing. Women in a phenomenological study by Kazimiera Andersson et al. (2013) similarly described fear of a recurrent cardiac event and mortality as a "constant companion" (p.765). Women who were at risk for and/or developed CAD described themselves as "no longer being immortal" and fearful for their future (Kazimiera Andersson et al., 2013, p.765). Likewise, women in a phenomenological study by Qin et al. (2022) also reported that being diagnosed with CAD resulted in feelings of uncertainty and insecurity about their future.

Furthermore, the qualitative findings in an integrated review by Alyasin et al.

(2021) and two cross-sectional studies by Marcuccino et al. (2003) and Thurston and Kubzansky (2009) highlighted that women's relationships were altered after a diagnosis of CAD, leading to feelings of isolation and loneliness. For instance, Marcuccino et al. (2003) noted that based on their findings, women's relationships with friends and family underwent significant changes following a CAD diagnosis. This included challenges in providing care for their families, alongside feelings of resentment from family members and allegations that they had exaggerated the severity of their condition. Similarly, a high-quality cross-sectional study by Thurston and Kubzansky (2009) revealed that due to altered relationships, women with CAD feel lonely and isolated. Based on 3,003 participants, Thurston and Kubzansky (2009) found that women with CAD were 1.76 times more likely to experience loneliness than women who did not have CAD (HR 1.76, 95% CI: 1.17-2.63).

This sense of loneliness was also identified in the qualitative findings in the review by Alyasin et al. (2021), when women described feelings of being lonely and empty since their diagnosis of CAD, due to changes in communication, sexual relations, and altered social interactions. These findings hold considerable importance as the existing literature on risk suggests that interpersonal interactions influence risk perception (Lupton, 2013). Consequently, familial responses and altered interactions with family members may influence their perceptions of health risks and diagnoses, ultimately affecting their health behaviours and subsequent actions.

Summary of the Impact of CAD

Based on the preceding review of the impact of CAD in women, it is evident that the disease significantly burdens both the physical and mental health of women and the healthcare system. HCPs need to address the development of CAD in women, as it is the leading cause of premature death among them, and mortality rates are rising. Additionally, it is crucial to reduce the onset of CAD in women due to the increasing costs this disease places on the healthcare system and the adverse effects CAD have on women's psychosocial well-being. Focusing on preventing the onset of CAD in young women is essential, as they experience poorer outcomes compared to men in the first year following a cardiac event.

Contributing Factors

Both traditional risk factors and non-traditional risk factors specifically related to pregnancy-related complications contribute to the development of CAD. These risk factors will be outlined below.

Traditional Risk Factors

Traditional risk factors for CAD in women (and men) include obesity, smoking, diabetes, dyslipidemia, sedentary lifestyles, and hypertension (Garcia et al., 2016; Humphries et al., 2017; Jaffer et al., 2021; Maas & Appleman, 2010; Norris et al., 2020). Many Canadian women possess at least one of these CAD risk factors (Jaffer et al., 2020; Norris et al., 2020). Some women demonstrate greater cardiac risks due to these traditional risk factors than men. For instance, smoking is identified as the most preventable cause of CAD in women, raising the risk of CAD sevenfold compared to non-smokers (Mulvagh et al., 2021). Importantly, women over 45 years old face a 25% higher risk of developing CAD if they smoke, relative to men (Garcia et al., 2016; Mehta et al., 2016; Mulvagh et al., 2021).

Women have also been found to be less physically active and have undiagnosed hypertension in comparison to men (Garcia et al., 2016; Garriguet & Colley, 2012; Lytvyak et al., 2022; Mulvagh et al., 2021). Obesity has significantly increased from 22.2% of Canadians to 27.2% of Canadians between 2005 and 2018 ($p<0.001$) (Lytvyak et al., 2022). In women, in particular, the prevalence of obesity in Canadian women has increased from 20.4% in 2005 to 25.4% in 2018 ($p < 0.001$) (Lytvyak et al., 2022). Furthermore, there were slightly larger increases in obesity among Canadian women than men (5.4% in women versus 3% in men). Since obesity and inactive lifestyles contribute to the development of CAD, it is imperative to develop preventive strategies for women living with these traditional risk factors to help mitigate the onset of CAD.

Pregnancy-Related Non-traditional Risk Factors

Pregnancy poses significant stress on a woman's heart due to the heightened demands on her body to support the fetus (Sanghavi & Rutherford, 2014). For instance, the cardiovascular system faces increased pressure to provide sufficient blood flow to the placenta (Ramlakham et al., 2020). Moreover, complications arising from pregnancy, such as pre-term birth, GDM, pre-eclampsia, and intrauterine growth restriction, have been shown to elevate the risk for future CAD in women (Grandi et al., 2019; Graves et al., 2019; Haas et al., 2020; Lane-Cordova et al., 2019; Park et al., 2015; Smith et al., 2013).

Among these non-traditional risk factors, GDM is one of the most significant pregnancy-related complications contributing to the risk and development of CAD (Chen et al., 2024; Kramer et al., 2019; Minhas et al., 2024; Norris et al., 2024). Women diagnosed with GDM face lifelong CAD risk (Diabetes Canada, 2021; Fu & Retnakaran, 2022; Garcia et al., 2016; Green, 2021; Kramer et al., 2019). A systematic review of cardiovascular disease in women by Garcia et al. (2016) revealed that women with pre-eclampsia were more likely (OR 2.16, 95% CI: 1.86-2.52) to develop CAD after 12 years post-partum when compared to women who did not have pre-eclampsia. Likewise, women with GDM were found to have a sevenfold risk of developing type 2 diabetes, which is a risk factor for CAD (Garcia et al., 2016). However, independent of going on to develop type 2 diabetes, having GDM quadrupled the risk of developing an MI in comparison to women who had not had GDM (Garcia et al., 2016). This was further exemplified in the findings of a systematic review and meta-analysis by Kramer et al. (2019). The findings of the review showed that, based on data of 5,390,591 women and 101,424 cardiac events, women with GDM had a 56% higher risk of having a cardiac event in the future whether they went on to develop type 2 diabetes or not (Diabetes Canada, 2021; Green, 2021; Kramer et al., 2019).

These findings underscore the fact that GDM significantly increases the risk for CAD in women. Therefore, it is essential to focus on risk reduction strategies to prevent the development of CAD in women who exhibit any of these risk factors. Although GDM constitutes a notable risk factor for CAD, research has indicated that neither women nor HCPs recognize this risk (McDonnell et al., 2014; McDonnell et al., 2018). This subject will be extensively addressed in the subsequent section of this literature review.

The Social Construction of CAD in Women

The literature delineates that the social construction of CAD in women significantly shapes how women experience, perceive, and have historically been treated for the disease (Davison et al., 1991; Heart and Stroke Foundation, 2018). Established research indicates that the understanding of CAD risk and its progression in women is notably influenced by the perception that CAD is a socially constructed phenomenon primarily affecting males (Conrad et al., 2010; Davison et al., 1991; Galcik et al. 2015; Heart and Stroke Foundation, 2018; Jaffer et al., 2021). According to this social construction, societal perceptions concerning CAD risk and its development in women are influenced by four critical factors: subjective experiences, societal influences, the lack of sex-specific research, as well as sex and gender differences (Conrad et al., 2010; Davison et al., 1991; Heart and Stroke Foundation, 2018; Jaffer et al., 2021; Norris et al., 2020). It is these factors that have contributed to the notion of risk perception surrounding CAD in women. Risk perception refers to an individual's evaluation of their susceptibility to a health threat, which significantly impacts how they approach and make decisions regarding health care behaviour to alleviate the recognized threat (Ferrer et al., 2015). The existing literature suggests that risk perception is influenced by individual experiences and interactions with others, and is inherently subjective (Beck, 1992; Ferrer et al., 2015; Krimsky & Golding, 1992; Lupton, 1999, Lupton, 2013; Manuel, 2015). Therefore, risk perception is not solely influenced by objective knowledge or a singular incident, but it is socially constructed and shaped and reshaped by the factors discussed below (Beck, 1992; Douglas, 1992; Ferrer et al., 2015; Krimsky & Golding, 1992; Lupton, 1999; Lupton, 2013; Manuel, 2015).

Women's Subjective Perceptions

In alignment with the risk literature above, the literature on CAD in women reports that women's subjective perception of their risk for CAD is low (Berry et al., 2016; Cushman et al., 2021; Foxwell et al., 2013; Gooding et al., 2020 Berg Gundersen et al., 2017; Lichtman et al., 2015; Heart and Stroke Foundation, 2018; Maas & Appleman, 2010; McDonnell et al., 2014; Moeini et al., 2012; Mosca et al., 2004). The perception of low risk associated with CAD among women is a prominent finding in several qualitative studies that have been conducted regarding women's perceptions of CAD (Brown et al., 2024; Galick et al., 2015; Gooding et al., 2021; Berg Gundersen et al., 2016; Lichtman et al., 2015). Findings from a systematic review by Brown et al. (2024) of 43 studies of qualitative literature that explored the healthcare experiences of women and men living with CAD revealed that women assume CAD is a "man's disease." This notion has contributed to their low perception of risk in developing CAD and their reluctance to seek medical attention (Brown et al., 2024). Similarly, a qualitative descriptive study conducted by Gooding et al. (2021) employed focus groups consisting of 35 women. This study reported that participants were unaware that heart disease is the leading cause of death among women, often perceiving the condition as primarily affecting men and those over the age of 40.

Like the qualitative literature, the search did yield several medium and high-quality quantitative studies that have reported that women have low risk perception for CAD and are unaware that CAD is the leading cause of death in women, despite having the risk factors (e.g., overweight, physically inactive, smoker, etc.) (Berry et al., 2016; Cushman et al., 2021; Foxwell et al., 2013; Hart et al., 2005; Heart and Stroke Foundation, 2018; Maas & Appleman, 2010; McDonnell et al., 2014; Moeini et al., 2012; Mosca et al., 2004). Two older, medium-quality studies, conducted in the United States and Canada, surveyed women to assess their risk perceptions for CAD and knowledge of CAD outcomes. Legato et al. (1997) surveyed 1002 American women with traditional risk factors and reported that 44% of the participants considered themselves unlikely to develop CAD. Likewise, a medium-quality study by Mosca et al. (2004) that surveyed 1024 American women found that only 46% identified CAD as the leading cause of death in women. This is also true for younger women under the age of 55 (Berry et al., 2015; Foxwell, Morley, & Frizelle, 2013; Maas & Appleman, 2010; Moeini et al., 2012). For instance, the Heart and Stroke Foundation (2018) surveyed 2000 young women aged 19 to 29. The study found that 37% of women in the 19-29 age bracket believed that CAD affects women differently than men, in contrast to 67% of women aged 30 and above.

Despite efforts to raise awareness about women's risk for CAD, research has shown that their risk perception remains low and, in some cases, decreasing (Cushman et al., 2021; McDonnell et al., 2014). For example, a Canadian study by McDonald et al. (2014) found that 60% of women at high risk for CAD, based on having traditional risk factors, perceived their risk as low. However, a more current study by Cushman et al. (2021), who compared the findings of two American Heart Association National surveys conducted in 2009 and 2019, found that women's knowledge that CAD is a leading cause of mortality in women declined from 65% in 2009 to 44% in 2019. Women ages 25-35 had the most significant decrease in their knowledge (OR 0.19, 95% CI [0.10-0.34]).

Women's underestimation of their risk has been shaped by their inability to identify typical objective signs and symptoms of CAD (Berry et al., 2016; Cushman et al., 2021; Foxwell et al., 2013; Gooding et al., 2021; Berg Gundersen et al., 2017; Heart and Stroke Foundation, 2018; Maas & Appleman, 2010; McDonnell et al., 2014; Moeini et al., 2012; Mosca et al., 2004). Qualitative literature has shown that women perceived their risk for CAD as low despite being inactive, smoking, and living with high blood pressure, and were often unaware of the signs of a cardiac event (Berry et al., 2016; Berg

Gundersen et al., 2016). A qualitative descriptive study of 30 women by Lichtman et al. (2015) found that even women with a family history and other risk factors (e.g., smoking) for heart disease did not recognize that they had a personal risk for the disease. For example, one woman did not make the connection between her father dying of heart disease and her elevated risk. Similarly, participants in a phenomenological study conducted by Berg Gundersen et al. (2017) found that even after experiencing symptoms of CAD, women still attributed these indicators to factors such as fatigue, burnout, and increasing age, not CAD. These findings raise significant concerns, as it is essential for women living with risk factors for CAD to be cognizant of their risk and aware of cardiac signs and symptoms.

Societal Influences

The primary societal factor highlighted in the literature that contributed to the low-risk perception for CAD in women is their interactions and communication with HCPs (Andraweera et al., 2022; Bairey Merz et al., 2017; Berry et al., 2015; Beussink-Nelson et al., 2022; Brown et al., 2024; Colella et al., 2021; Gooding et al., 2021; Jaffer et al., 2021; Mulgavh et al., 2024; Nielsen et al., 2022; Norris et al., 2024). The findings from a qualitative meta-analysis conducted by Galick et al. (2015) regarding women’s experiences with heart disease indicate that stereotypes associated with heart disease in men predominantly influence HCPs’ understanding of CAD risk in women, thereby affecting their interactions and the knowledge conveyed to these patients. Similarly, participants from the qualitative descriptive study by Frich et al. (2006) felt that HCPs did not take women’s risk factors (e.g., family history, symptoms of CAD) seriously. Instead, they were often dismissed home or unassessed for cardiac symptoms due to reasons such as their age and sex. Consequently, the risk communication of the disease to this cohort has been lacking.

Evidence suggests that HCPs themselves lack sufficient knowledge and understanding of the presentation and risks associated with coronary artery disease (CAD) in women (Colella et al., 2021; Heart and Stroke Foundation, 2018; Woodward et al., 2019). Both a review by Colella et al. (2021) and a survey conducted by the Heart and Stroke Foundation (2018) have revealed that physicians tend to underdiagnose and misdiagnose CAD in women. The Heart and Stroke Foundation (2018) reported that only 22% of physicians and 42% of cardiologists felt prepared to assess CAD in women. Notably, fewer than 50% of medical science students receive sex- and gender-specific clinical training, which further contributes to these knowledge and care gaps (Rojek & Jenkins et al., 2016; Mulvagh et al., 2024). Consistent with these findings, women are often underdiagnosed and misdiagnosed due to variations in risk profiles based on typical male symptoms of MI (Colella et al., 2021; Woodward et al., 2019).

Based on these findings, women’s subjective perception of risk for CAD is low, and their interactions with HCPs have perpetuated this due to their lack of knowledge on CAD in women. As such, HCPs are not providing adequate communication about women’s actual risk for CAD. Evidence suggests that laypersons rely on HCPs, researchers, and their networks to shape their perceptions of risk and inform decisions about their health (Bostrom, 1997; Davidson, 1991; Lupton, 1999, 2023). Consequently, the knowledge held by HCPs is a critical factor influencing risk perception. Thus, understanding the risk factors and associated symptoms of CAD, as well as communicating these risks effectively, is crucial for informing patients about their health-related risks (Atherton et al., 2018; Bakhit et al., 2024; Hawking et al., 2019; Sebastian, 2004; Schulberg et al., 2022). Hence, these findings highlight the need for HCPs and women to be educated about women's actual risk for CAD, thereby enhancing awareness and potentially reducing disease development.

Lack of Sex-Specific Research

Adding to the subjectivity and societal influences, the lack of sex-specific research on women, as discussed in the literature, has also contributed to the social construction of CAD (Brown et al., 2024; Heart and Stroke Foundation, 2018; Jaffer et al., 2021; Norris et al., 2020). CAD knowledge development has been built on the premise of men having the highest risk for CAD (Jaffer et al., 2021; Norris et al., 2020). Additionally, knowledge translation activities focused on risk factors and pharmacological considerations to prevent and treat CAD have been based on men (Cangemi et al., 2017; Connelly et al., 2021; Heart and Stroke Foundation of Canada, 2018; Jaffer et al., 2021; Norris et al., 2020; Thomas & Braus, 1998; Woodward, 2019).

Research surrounding CAD from the 1950s to the 1990s predominantly focused on male subjects (Brown et al., 2024; Davison et al., 1991; Emslie et al., 2005; Thomas & Braus, 1998). For example, a systematic review that included 60 qualitative studies noted that CAD research was done exclusively on men until the 1990s, and findings were generalized at a population level (Brown et al., 2024; Emslie et al., 2005). A significant reason for this trend was the exclusion of women from drug trials between the 1960s and 1997, stemming from the thalidomide tragedy (Thomas & Braus, 1998). This tragedy occurred when thalidomide was prescribed to women across 46 different countries who were either pregnant or became pregnant, resulting in birth defects (Kim & Scialli, 2011).

Consequently, researchers became apprehensive about including women in research studies, and numerous pharmaceuticals employed in the treatment of CAD have not undergone evaluation specifically among women to ascertain sex-specific safety and efficacy.

Adding to this, recent findings indicate that women remain less likely to be prescribed cardiac medications in comparison to men (Cangemi et al., 2017; Connelly et al., 2021; Rossouw et al., 2002; Streed Jr. et al., 2021). A systematic review conducted by Zhao et al. (2020) that encompassed 43 observational studies regarding the sex-specific prevalence of prescription for women of aspirin, statins, and antihypertensives revealed that the prevalence of prescribed medications for CAD among women was 41% for aspirin, 60% for statins, and 68% for antihypertensives. In contrast, the corresponding rates for men were 56%, 63%, and 69%. Therefore, these findings suggest that the understanding of prevention and treatment of CAD in women through pharmacological interventions has historically been, and continues to be, insufficiently addressed.

Sex and Gender Differences

Sex and gender differences in how men and women present with CAD exist and have also contributed to how CAD in women has been socially constructed. The literature review previously addressed the characteristics of CAD presentation in women. For instance, women are more likely to exhibit other symptoms such as belching, upper back pain, pain in the arm, neck, and jaw, unusual fatigue and sweating, feelings of anxiety or fear, nausea and vomiting, palpitations, weakness, and flu-like symptoms (Alraies & Pina, 2019; Devon et al., 2014; Madonis et al., 2017; Mehta et al., 2016; Pacheco et al., 2022). This is particularly true in women under the age of 55 (Pacheco et al., 2010;

Tisminetzky et al., 2020). Women are also more likely to present with non-ST-segment-elevation when experiencing an MI and varying patterns on an EKG compared to men (Norris et al., 2020; Pepine et al., 2015).

Qualitative research indicates that since women do experience these subtle and non-specific symptoms of CAD, which both women and HCPs may disregard, they are often dismissed as suffering from non-cardiac conditions (Frich et al., 2009; Lichtman et al., 2015). This is particularly true for younger women under the age of 55. For example, in a qualitative descriptive study by Frich et al. (2009), a 31-year-old participant was denied a cholesterol test because her HCP felt that a raised cholesterol level should not occur in a younger woman. It is essential to emphasize the fact that these sex specific differences have been poorly understood by women and HCPs (Heart and Stroke Foundation, 2018; Norris et al., 2020). The lack of knowledge of sex specific differences has contributed to how CAD in women has been socially constructed (Heart and Stroke Foundation, 2018).

Experts have emphasized that the constructs of gender roles, gender identity, and gender relations about women have significantly contributed to women's insufficient participation in research, reluctance to pursue medical attention for cardiovascular health, and diminished levels of involvement in an active and healthy lifestyle (Heart and Stroke Foundation of Canada, 2018; Jaffer et al., 2021; Norris et al., 2023). Gender roles encompass feminine characteristics, including caregiving and familial responsibilities that women often assume and prioritize (Connelly et al., 2021; Pelletier et al., 2016).

Literature reveals that women's struggle for gender equality has resulted in a scenario in which they frequently prioritize family and professional responsibilities over their personal health and well-being (Barrett-Connor, 1997; Connelly et al., 2021; Heart and Stroke Foundation of Canada, 2018; Nyberg et al., 2013; O'Neil, 2018; Pelletier et al., 2016). Therefore, women may ignore the symptoms and preventive measures for CAD due to social norms and expectations (i.e., fulfilling the caregiver role while balancing this with work responsibilities) (Connelly et al., 2021; Pelletier et al., 2016). This was an evident finding in qualitative literature conducted on women's experiences with heart disease (Brown et al., 2024; Galick et al., 2015; LaCharity, 1997; Lichtman et al., 2015). For example, a qualitative meta-analysis of 43 studies by Galick et al. (2015) identified that women tend to conceal their symptoms and postpone seeking medical attention to prevent their health issues and general unwellness from disrupting their household responsibilities and caregiving commitments to their families. Women sought to prevent any perceptions within their families that they were lazy, incapable of fulfilling their anticipated responsibilities (e.g., cleaning, cooking, etc.), or inducing stress for their families. Likewise, a systematic review of qualitative literature by Brown et al. (2024) and qualitative descriptive studies by LaCharity (1997) and Lichtman et al. (2015) also identified that women in the study acknowledged that the focus of their lives were on taking care of the family and home over taking better care of themselves and their bodies.

The Heart and Stroke Foundation of Canada released a report entitled "Ms. Understood." This report was designed to raise awareness of CAD and stroke in women and to highlight the fact that women have been under-researched, under-diagnosed, under-treated, and under-supported post recovery (Heart and Stroke Foundation, 2018). One such topic discussed in the "Ms. Understood" report was sex and gender differences in men and women regarding CAD, and the fact that while the differences exist, it is poorly understood how gender contributes to a woman’s risk for CAD (Heart and Stroke Foundation, 2018). Furthermore, Canadian literature on women and CAD set out by the Canadian Women’s Heart Health Alliance also emphasized that the gender roles that women enact, such as putting family and work life before their own health and disease prevention, are significant barriers to participating in research, seeking medical attention, and living active and healthy lifestyles (Heart and Stroke Foundation of Canada, 2018; Jaffer et al., 2021).

Summary of the Social Construction of CAD in Women

It is through the intersection of these factors (subjective perceptions, societal influences, research, and sex and gender differences) that the risk for CAD has been socially constructed and contributed to risk perception. Major organizations, such as the Heart and Stroke Foundation and the Canadian Women’s Heart Health Alliance, are now taking initiatives to raise awareness of CAD in women, aiming to increase awareness of CAD risk and its associated risk factors. For example, the Canadian Women’s Heart Health Alliance is now developing a guide to address barriers related to the knowledge and research on CAD in women. Based on the findings discussed in the preceding sections, action is needed to increase women’s understanding of their risk for CAD so that they can identify early signs of CAD and take preventive action to mitigate symptoms. The findings also highlight the need to increase HCPs’ knowledge, so that they may inform women of their risk and aid in mitigating CAD awareness and development.

Background of Gestational Diabetes Mellitus

Given the high risk of developing CAD after GDM, a more comprehensive examination of GDM, including its pathophysiology, diagnosis, and presentation, prevalence and incidence, implications of GDM, and issues related to managing GDM during and into the postpartum period will be presented, to provide context about the disease's burden on women and its connection to CAD.

Pathophysiology, Diagnosis, and Presentation of GDM

GDM is a condition of glucose intolerance in which a woman previously undiagnosed with diabetes exhibits high blood glucose levels during the second or third trimester of pregnancy (Chen et al., 2015; Diabetes Canada, 2021; Guariguata et al., 2014). In Canada, pregnant women are screened between 24 and 28 weeks' gestation for GDM using pre-specified criteria (Diabetes Canada, 2021). If positive, this test is completed again postpartum. The most common screening process for GDM is the 50g Glucose Challenge Test (GCT) followed by a plasma glucose 1 hour later (Diabetes Canada, 2021).

During pregnancy, insulin sensitivity shifts in response to the changing needs of the fetus (Plows et al., 2018). Early in pregnancy, the body stores glucose in adipose tissue to prepare for the demands of the fetus later. However, as the pregnancy progresses, a combination of local and placental hormones results in mild insulin resistance, which slightly elevates blood glucose levels to facilitate transport to the placenta, thereby aiding in fetal growth (Plows et al., 2018). The pregnant body should compensate for these changes through the development and enlargement of pancreatic beta cells and increased glucose-stimulated secretion. However, these adaptations during pregnancy do not occur in all women, and those who do not experience these adaptations are diagnosed with GDM (Plows et al., 2018). GDM does not always cause symptoms for pregnant women. However, if blood sugar levels rise significantly, women may experience increased tiredness, physical weakness, and increased thirst, similar to other forms of diabetes. (Craig et al., 2020; Diabetes Canada, 2021). GDM can also be associated with fetal macrosomia, which is defined as an infant being born weighing over 4000g (KC et al., 2015).

Causes of GDM during pregnancy can be due to several different metabolic conditions in conjunction with pregnancy hormones (Diabetes Canada, 2021). These include: 1) hyperglycemia present before pregnancy (e.g., glucose intolerance, elevated first-trimester fasting glucose, overt diabetes during pregnancy, monogenic diabetes); 2) decreased or declining secretory capacity (e.g., developing type 1 diabetes); and 3) significant insulin resistance from early pregnancy (polycystic ovarian syndrome, women with overweight or obesity, some ethnic groups) (Diabetes Canada, 2021). Other health-related factors that contribute to the development of CAD include increased maternal age, obesity pre- and during pregnancy, family history of diabetes, previous GDM, and genetic predisposition for GDM/type 2 diabetes (Diabetes Canada, 2021; Larrabure-Torrealva et al., 2018; Lee et al., 2018; Li et al., 2020; Lowe et al., 2016; Nerenberg et al., 2014; Pons et al., 2015). Therefore, there are a plethora of health-related reasons why women develop GDM.

Of the health-related risk factors outlined above, multiple studies have revealed that maternal age and obesity are significant risk factors for GDM (Larrabure-Torrealva et al., 2018; Lee et al., 2018; Li et al., 2020; Nerenberg et al., 2014). For example, a high-quality Canadian cohort study by Nerenberg et al. (2014) found that women with increasing maternal age were more likely to develop GDM than younger women (OR 1.7, 95% CI [1.6-1.7]). When comparing baseline characteristics of participants, the mean age of women with GDM was 31.5, whereas the mean age of women without GDM was 28.4. This is concerning, as maternal age increased over the last two decades (Statistics Canada, 2024) from 29 in 2001 to 31 in 2021 (Statistics Canada, 2024). There has also been an increase in the proportion of Canadian mothers of advanced maternal age (Statistics Canada, 2024). In 2021, the proportion of mothers over 35 was 25% versus 16% in 2001 (Statistics Canada, 2024). Based on these findings, with increasing maternal age, more women will be at risk for GDM. Furthermore, women who were obese pre-pregnancy were 2.5 times more likely to develop GDM than women who were not obese (OR 2.5, 95% CI [2.4-2.6]) (Nerenberg et al., 2014). With 25.4% of Canadian women being obese and obesity being a risk factor for GDM, more women are at risk for CAD (Lytvyak et al., 2022). This is concerning because as the rates of GDM rise, so does the risk that more women develop CAD.

In summary, it is evident that while some women have symptoms of GDM, others do not. However, all women are screened for GDM during pregnancy. Therefore, whether women have symptoms or not, women are being screened and diagnosed with the condition.

Prevalence of GDM

GDM is on the rise worldwide (Behboudi- Gandevani et al., 2019; Wang et al., 2022). In a systematic review and meta-analysis by Behboudi-Gandevani et al. (2019), the worldwide prevalence of GDM was found to be 10.6% (95% CI [10.5-10.6%]) of pregnant women. However, in a more recent systematic review and meta-analysis by Saeedi et al. (2021), the prevalence of GDM was 14.7%. This is a clinically meaningful change from the evidence published in 2019. Similarly, a more recent review by Wang et al. (2022) found the global prevalence of GDM to be 14.4% (95% CI [13.97-14.04%]). This is a very slight change from the 2021 results. There has also been an increase in GDM in Canada from 41.2 per 1,000 deliveries in 2005 to 104.3 per 1,000 deliveries in 2019, representing an increase of 162.7% (Nelson et al., 2024). Increases in prevalence rates have been noted across all Canadian provinces. NL has specifically seen a rise from 33.7 per 1,000 births in 2005 to 72.6 per 1,000 births in 2019 (Nelson et al., 2024). Since GDM is on the rise, this is concerning, as GDM is a non-traditional risk factor for CAD that poses a high risk for CAD development.

Implications of GDM

Although type 2 diabetes and complications affecting newborns are associated with GDM, this literature review will focus on the existing literature regarding the risk of CAD.

GDM is associated with an increased risk of CAD later in life (Bellamy et al., 2009; Kramer, 2019). A review by Bellamy et al. (2009), based on 20 medium- to high-quality cohort studies (n = 675,455 women), found that women with GDM were more likely to develop type 2 diabetes than women without GDM (RR 7.43, 95% CI [4.79-11.51]). Type 2 diabetes is a known risk factor for CAD, as discussed earlier. However, it is essential to note that the risk of CAD in women post-GDM exists whether they later develop type 2 diabetes or not. Kramer et al. (2019) found that, based on an analysis of nine observational studies (eight cohort and one case-control; n=5,390,591) of high to medium quality, women with GDM, regardless of developing type 2 diabetes, still had a 56% higher risk of developing CAD (Kamer et al., 2019). Furthermore, these women were more likely to develop CAD in the first 10 years postpartum (RR 2.31, 95% CI [1.57-3.39]) (Kramer et al., 2019). These findings clearly indicate that GDM poses a risk for CAD.

There has been an abundance of literature examining women's perceptions of risk for type 2 diabetes after GDM (Craig et al., 2020; Malcolm et al., 2009; Parsons et al., 2014; Sandsaeter et al., 2019; Vu et al., 2022; Zera et al., 2013). However, there is a limited body of literature that has explored women's perceptions and knowledge of future health risks post-GDM. Existing literature, however, notes that women do not perceive themselves to be at risk for CAD post-GDM (Aldridge et al., 2023; Beussink-Nelson et al., 2022; Ghisi et al., 2023; Sandsaeter et al., 2019). For example, a systematic review by Ghisi et al. (2023) based on 15 studies (10 quantitative studies and five qualitative studies) with women with a recent or past diagnosis of pregnancy-related hypertensive disorders, GDM, and premature birth, found that the women with GDM were unsure about the long-term health impacts of GDM, such as CAD. Similarly, Aldridge et al.

(2023) discovered that over two-thirds (69.1%) of the women included in their study were not aware of the correlation between pregnancy complications and CVD, and 6.4% of the cohort did not recognize that they had experienced a complicated pregnancy. Almost 10 % of the cohort did not correctly identify the complications they had been diagnosed with during pregnancy.

Based on these findings, we can conclude that GDM is associated with future disease later in life, and the increasing rates of GDM mean more women are exposed to the risk for type 2 diabetes and CAD. There is also a limited body of knowledge indicating that women with GDM do not perceive themselves to be at risk for CAD after GDM. However, while we have some insight into women's perceptions of risk for CAD following GDM, it needs to be further explored, considering CAD is the leading cause of mortality in women.

Issues Related to Managing GDM During Pregnancy and into the Postpartum Period

The literature indicates that women face challenges in managing necessary lifestyle changes during GDM and in the postpartum period, as well as in receiving adequate follow-up and screening (Larrabure-Torrealva et al., 2018; Lee et al., 2018; Li et al., 2020; Nerenberg et al., 2014). These challenges will be discussed below.

Lifestyle Changes

Healthy lifestyle changes are not only needed for the mother and baby during pregnancy for maternal and fetal health, but also to prevent future risk for type 2 diabetes and CAD. Obesity is a recognized risk factor for the development of GDM and CAD

(Evans et al., 2010; Lytvyak et al., 2022; Nerenberg et al., 2014). Despite this, numerous studies of medium and high quality have found that women with GDM do not make the necessary healthy lifestyle changes to mitigate their risk (Craig et al., 2020; Gao et al., 2018; Lawrence et al., 2010; Parsons et al., 2014; Sandsaeter et al., 2019). A national health survey conducted in the United States from 2007 to 2014 assessed the prevalence of factors associated with participating in healthy lifestyle behaviours and found no significant difference in health behaviours between women with or without GDM. Furthermore, a Canadian mixed-methods study by Evans et al. (2010) found that women with GDM seldom followed Canada Food Guide recommendations. The literature suggests that a lack of knowledge and balancing life with new motherhood are two significant barriers to making these lifestyle changes during and after gestational diabetes mellitus (GDM).

Knowledge. The qualitative literature indicates that one of the primary reasons women fail to adopt healthy lifestyle changes is insufficient understanding of the requisite dietary and lifestyle modifications necessary to prevent GDM and type 2 diabetes in the postpartum period (Bandyopadhyay et al., 2011; Craig et al., 2020; Evans et al., 2010; Gray et al., 2020). Furthermore, the extent of their knowledge significantly influences their perceptions of risk during and after GDM, in that, without awareness of the potential risks for diseases such as diabetes and CAD in the future, women perceive no compelling reason to initiate or persist in these lifestyle changes. The literature suggests that women regard GDM as a condition that "resolves" without any implications for their future health (Craig et al., 2020). For example, a systematic review conducted by Craig et al. (2020), comprising 41 qualitative studies of medium to high-quality evidence, noted that women frequently refer to the birth of their child as the “moment of truth” when GDM concludes, leading to a return to a state of normalcy (p. 9). Consequently, they deem lifestyle modifications unnecessary. A qualitative descriptive study by Martis et al. (2018) corroborated these findings, revealing that women perceive GDM as a transitory condition.

Some investigators have attributed women’s lack of knowledge to the fact that HCPs did not provide the proper education on the need to make healthy lifestyle changes (Craig et al., 2020; Khooshehchin et al., 2016; Lawrence et al., 2015; Lennon, 2018; Sandsaeter et al., 2019). Additionally, women were not satisfied with the information received during and post-pregnancy and desired further education to manage their health (Helmersen et al., 2021; Lawrence et al., 2015; Sandseater et al., 2019). Women with GDM specifically reported having limited engagement and support from HCPs in obtaining necessary information and follow-up during and post-GDM (Craig et al., 2020; Khooshehchin et al., 2016; Lawrence et al., 2015; Lennon, 2018; Sandsaeter et al., 2019). For example, Craig et al. (2020) reported that a lack of communication about GDM management from HCPs was a common theme among women with GDM. The women received little information and therefore had limited knowledge. For example, Helmersen et al. (2021) established that women seeing general practitioners had limited knowledge about GDM, especially dietary advice. In addition, other qualitative studies highlighted the lack of continuity of care and poor relationships with HCPs as factors impeding participants’ knowledge as they received differing information from different HCPs (Helmersen et al., 2021; Lawrence et al., 2015; Parsons et al., 2014; Sandsaeter et al., 2019). Findings from Sandsaeter et al. (2019) showed that women with GDM felt left alone both during and after pregnancy in terms of follow-up on healthy eating, and that HCPs did not provide the encouragement and education to make these changes. One participant in the study believed that, because an HCP did not follow up on healthy eating post-pregnancy, making and maintaining healthy lifestyle changes was unnecessary (Sandsaeter et al., 2019).

In conclusion, women who have had GDM do not make lifestyle modifications due to a deficiency in knowledge, which also affects their perception of the risks associated with GDM and the postpartum period. Poor knowledge includes insufficient understanding among women regarding appropriate lifestyle behaviours, as well as the reality that GDM presents risks for future health issues, such as CAD, and is based on the relationships and information conveyed by HCPs This situation presents a concern, as it is apparent that women are not receiving the necessary information to adopt healthy lifestyle practices. Furthermore, engaging in healthy lifestyle practices is crucial during both the GDM period and the postpartum phase for the mother's well-being and to assist in mitigating the risk of future diseases (e.g., type 2 diabetes and CAD).

Balancing a healthy lifestyle with motherhood. Second, the literature highlighted that women struggle with balancing having a healthy lifestyle with new motherhood and family responsibilities (Evans et al., 2010; Kandasamy et al., 2021; Middleton et al., 2015; Sandsaeter et al., 2019; Zera et al., 2013). Several qualitative studies of high trustworthiness explored women’s experiences with GDM and making lifestyle changes post-GDM and found that women were challenged to incorporate healthy lifestyle practices post-partum with fatigue and family responsibilities (Evans et al., 2010; Kandasamy et al., 2021; Middleton et al., 2015; Sandsaeter et al., 2019; Zera et al., 2013). Women described their lives as too busy and tiring to exercise or prepare healthy meals (Craig et al., 2010; Evans et al., 2010; Kandasamy et al., 2021; Middleton et al., 2015). For example, Sandsaeter et al. (2019) found that study participants felt they did not have the energy to exercise and eat well due to a busy life with a young baby or child. Furthermore, Craig et al. (2020) highlighted that woman considered changing lifestyle habits an added responsibility. Therefore, healthy lifestyles were seen as challenging to maintain during pregnancy and postpartum (Craig et al., 2020). Similarly, a Canadian mixed-methods study by Evans et al. (2010) found that women described maintaining a healthy lifestyle postpartum as hard due to a lack of time and family responsibilities. Based on these findings, while healthy lifestyle choices are warranted, women prioritize their babies and families over their health needs. These findings are consistent with the gender aspect of the social construction of women's CAD discussed earlier in this review.

Screening and follow-up for women post-GDM

Considering the negative impacts of CAD and the increased incidence rates associated with GDM, women with GDM comprise an at-risk population for CAD and, hence, a potential opportunity for early risk factor surveillance and modification (Kramer et al., 2019). Follow-up for women with GDM to reduce the incidence of CAD is recommended in both Canadian and American guidelines (Graves et al., 2019; Jasper & Skelding, 2018; Mehta et al., 2015; Srivaratharajah & Abramson, 2019; Poola-Kella et al., 2018). This includes formalized post-partum follow-up schedules, screening protocols, physical exams, and education on lifestyle modifications (Graves et al., 2019; Jasper & Skelding, 2018; Mehta et al., 2015; Srivaratharajah & Abramson, 2019; Poola-

Kella et al., 2018). However, the written recommendations set out by Diabetes Canada for postpartum follow-up in women with GDM are very concrete for type 2 diabetes, but not for CAD. According to Diabetes Canada clinical practice guidelines, all women should be tested for GDM during pregnancy (Diabetes Canada, 2021; Berger et al., 2019). Moreover, women with GDM should then be offered a 75-gram oral glucose tolerance test between six weeks and six months postpartum to screen for type 2 diabetes and receive education on healthy behavior interventions (e.g., diet) to reduce the risk for type 2 diabetes (Diabetes Canada, 2021; Berger et al., 2019). However, the Diabetes Canada guidelines do not provide specific recommendations on when women with GDM should be screened and assessed for CAD, nor do they specify what this screening and assessment should include (Diabetes Canada, 2021; Berger et al., 2019). This is concerning given that although GDM resolves post-partum, it remains a risk factor for the development of CAD (Craig et al., 2020; Martis et al., 2018).

The United Kingdom has set out five criteria for appraising the effectiveness and appropriateness of population screening programs (Government of the United Kingdom, 2023). These criteria relate to the condition, the test, the intervention, the screening program, and the implementation criteria. The first four criteria relate to whether the condition is appropriate for screening, while the fifth relates to program management. I will only discuss the first four in relation to CAD screening for women who have had GDM. The first criterion is met since the condition, CAD, is a vital healthcare problem with multiple implications for women, and GDM is a rising and significant risk factor for CAD. This is a problem since CAD is the leading cause of premature death in women under the age of 55. The criterion for the test is also met. Testing is available for screening, and women who had GDM are accessible for screening. Validated screening tests exist to detect CAD and risk factors for CAD in general (e.g., lab values, EKG, echocardiography, cardiac catheterization). Therefore, we can screen women who have had GDM for CAD. Criterion three is that there must be a suitable intervention. We can prevent or mitigate CAD in women with interventions for healthier eating, increasing exercise, treating hypertension, quitting smoking, and reducing stress. Criterion four is that there should be evidence that a screening program is effective at reducing mortality and morbidity and is acceptable. We do not know if a screening program would effectively reduce mortality and morbidity for this population. However, we do know that screening programs are effective in reducing the morbidity and mortality of CAD in general.

Based on the four criteria, screening for CAD in women with a history of GDM is suitable. Although CAD is a significant problem, screening and testing are available, and we have interventions to prevent CAD in women, there is limited research on screening and intervention for CAD prevention after GDM. Therefore, it is essential to screen and intervene, but further research on women who have been diagnosed with GDM is needed.

Gaps in the Literature and Research Problem

Limited research on GDM as a risk factor for CAD exists beyond the evidence supporting this link. Before creating a suitable intervention, we need a better understanding of how women come to know, understand, assign meaning to, manage, and live with their risk for the subsequent development of CAD.

Based on existing literature, we know that women have limited knowledge of GDM and the health-related risks (e.g., type 2 diabetes, CAD) after GDM. The lack of knowledge on GDM is primarily due to relationships with HCPs, the lack of satisfaction with information received from HCPs and the education that HCPs provide (Craig et al., 2020; Khooshehchin et al., 2016; Lawrence et al., 2015; Lennon, 2018; Sandsaeter et al., 2019). However, it is not clear who women are getting their knowledge of the risk for CAD following GDM from (e.g., nurses, obstetrics, family doctor, nurse practitioner, social media, family, friends), when they receive education to gain knowledge on the risk for CAD following GDM (e.g., during pregnancy, postpartum, delivery room, etc.), and how they get their understanding of the risk for CAD post-GDM (e.g., verbally, pamphlets, one-on-one meetings, etc.).

Adding to knowledge, there is also limited literature that explores women's understanding and meaning of the risk for CAD after having had GDM. The two terms have distinct meanings but are interconnected in the way the psychosocial process unfolds. Understanding one's risk is a basic comprehension or knowledge that an actual risk exists. In this case, GDM is a risk factor for CAD. The meaning of the risk is based on women's subjective perception of the risk (e.g., whether the risk is serious or if CAD will develop). It gets shaped and re-shaped based on social interactions. If women do not understand their risk of CAD after GDM, the meaning based on their personal risk perception will be altered. We have limited evidence on women's perceptions of their risk for CAD after a diagnosis of GDM based on the current research conducted. However, of the existing findings, women with pregnancy-related complications such as GDM do not perceive a personal risk for CAD. Without perceiving a risk for CAD, changes are not likely to be made to help mitigate the disease. Due to the limited research findings, more insight into this risk perception is needed. It is unclear what specific factors shape risk perception in this cohort or at what point in the trajectory these women perceive their risk for CAD after GDM (Lupton, 2009; Lupton, 2013).

Moreover, the literature shows that women have difficulty making necessary behaviour changes (e.g., lifestyle changes) during and post-GDM (Larrabure-Torrealva et al., 2018; Lee et al., 2018; Li et al., 2020; Nerenberg et al., 2014). Healthy lifestyle changes are not only needed for the mother and baby during pregnancy for maternal and fetal health, but also postpartum and beyond to prevent future risk for type 2 diabetes and CAD. However, we have limited insight into how women live with the risk for CAD specifically, and if they would make behaviour changes or any changes in general, if they knew they were at risk for CAD after having had a diagnosis of GDM. Living with the risk for CAD needs to be further explored to gain a better understanding of how women live with the risk for CAD after having had a diagnosis of GDM and the factors involved.

Furthermore, follow-up for CAD following a diagnosis of GDM is not being done systematically. There are existing screening options and interventions to detect and prevent CAD in women. Still, there is limited research on specific screening and intervention for CAD prevention after having had GDM. Existing interventions would need to be revised, as there are different needs following a diagnosis of GDM.

Given the noted gaps, it is essential to explore how and what women know about their risk of CAD, whether they understand their risk for CAD, how they assign meaning to the risk of CAD, how women manage their risk, and how they live with the risk of

CAD. This would give us more insight into the psychosocial process. This insight is crucial for developing effective interventions, including formalized screening and follow-up, that address this issue.

Research Purpose and Question

The purpose of this GT study was to gain a fuller understanding of the psychosocial process experienced by women who have had GDM as they assign meaning to the risk of CAD and make coinciding decisions about their future health and well-being. This includes how women come to know that they are at risk for CAD, how they understand and assign meaning to their CAD risk, how they manage this risk, and how they live with the risk for CAD.

The research question was how do women living in the province of NL diagnosed with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD?

Methodology

A GT approach, as outlined by Glaser and Strauss (1967), guided this study. GT was introduced by Glaser and Strauss (1967) in the book *The Discovery of Grounded Theory: Strategies for Qualitative Research.* GT aims to discover and understand a psychosocial process as it unfolds when we have little or no knowledge about the phenomenon (Glaser, 1978; Glaser, 2005; Glaser & Strauss, 1967). GT is an inductive approach that allows a substantive or formal theory to emerge from the data to understand this process. (Glaser & Strauss, 1967). Researcher objectivity is crucial to the method as it ensures that the emerging substantive theory is grounded in the data. This means the findings are not based on the researcher's preconceived notions and experiences. In turn, this contributes to the trustworthiness of the research (Glaser & Strauss, 1967). A substantive theory focuses on a specific phenomenon of interest, illustrated by examining GDM as a risk factor for CAD in this study (Glaser & Strauss, 1967). The substantive theory is the foundation for one theory that can later be analyzed alongside other substantive theories to determine whether a formal theory emerges (Glaser & Strauss, 1967). As the findings are grounded in the data, the substantive theory will explain a pattern of behaviour or a psychosocial process under investigation. (Glaser & Strauss, 1967). A formal theory analyzes a broader comparison of diverse groups or topics of interest, such as the risks associated with various chronic diseases (Glaser & Strauss, 1967).

GT is an appropriate methodological approach because it examines phenomena where little is known, allowing a theory to be generated instead of testing one (Glaser & Strauss, 1967). Therefore, the purpose of this GT study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This includes how women awaken to the notion that they are at risk for CAD, how they understand, assign meaning to their risk for CAD, how they manage this risk, and how they live with CAD. No studies have been conducted in NL that address this phenomenon. We are also uncertain about the sources of knowledge and interactions that shape women's perception of being at risk for CAD after having had a diagnosis of GDM, or what supports are available or necessary for this cohort to manage their risk status.

Philosophical Underpinnings

GT draws on the philosophical underpinnings of pragmatism and symbolic interactionism as interpretive lenses to guide the study (Blumer, 1969; Chamberlain-Salaun et al., 2013; Hewitt et al., 2022). As researchers, we aligned ourselves with a post-positivist view and the tenets of these two philosophical foundations. Both philosophical stances will be discussed below, along with an overview of how the research team has used these aspects in the research process and how they align with post-positivism.

Symbolic Interactionism

The foundation of GT is based on concepts related to symbolic interactionism (Aldiabat & Navenec, 2011; Blumer, 1969; Chamberlain-Salaun et al., 2013; Mead, 1934). Symbolic interactionism examines the relationships that individuals cultivate within their natural and symbolic environments, including how symbols are used to convey meanings (Blumer, 1969; Aksan et al., 2009; MacDonald, 2001; Munhall, 2012). Individuals gain a more profound understanding of themselves and their surroundings through the interpretations and meanings assigned to social interactions with others, objects, and events (Aksan et al., 2009; Blumer, 1969; Nowell et al., 2021). Using this interpretive lens, our research team was able to conceptualize how women perceived their risk of CAD based on their social interactions. Moreover, we could examine how the meanings assigned to their social interactions influenced their concurrent decisions about their healthcare trajectory.

Pragmatism

Pragmatism is an iterative and inductive approach, suggesting that individuals participate in numerous social interactions that shape and reframe their perceptions and responses to various phenomena (Blumer & Morrione, 2004; James, 1907; Munhall, 2012). From this perspective, knowledge is neither fixed nor absolute, as people are continually engaged in experiences and interactions that influence their interpretations, decisions, and behaviours within their everyday contexts (Blumer & Morrione, 2004). Building on this philosophical foundation, our research team recognized that women diagnosed with GDM, who are at increased risk for CAD, have a range of experiences shaped by their social relationships and daily circumstances. Consequently, we acknowledge that the psychosocial process of this phenomenon is provisional and dynamic, evolving based on participants' perceptions and meanings, which are influenced by their subjective viewpoints and reflect multiple truths and realities (Glaser & Strauss, 1967).

Post-positivism

As researchers, we align with a post-positivist perspective. That is, there is one objective reality, but we also recognize that this reality and coinciding knowledge can change based on research and individuals' subjective experiences and realities (Guba & Lincoln, 1994; Levers, 2013; Lincoln & Guba, 2000; Popper, 1978). Consequently, experiences, exposure, and subjective insights also contribute to knowledge, rather than solely observation and objectivity (Levers, 2013). As previously discussed, symbolic interactionism and pragmatism are philosophical lenses used in GT, which also consider the existence of multiple realities and how objects, the self, and society influence one another. That knowledge is not static (Blumer & Morrione, 2004). In this research we adopt these views and use a post-positivist lens (Glaser & Strauss, 1967; Levers, 2013; Lincoin & Guba, 2000) based on the assumptions that participants' experiences and understandings of a phenomenon of interest will be different based on their experiences, interactions, and behaviours (Glaser & Strauss, 1967; Levers, 2013).

In this study, our researcher team positions itself as observers rather than active participants, allowing the findings to emerge organically from the data collected while remaining receptive to diverse experiences (Glaser & Strauss, 1967; Lincoln & Guba, 2000). We were also aware that employing an objective lens during the interview process would present challenges and acknowledged that the research process itself is not devoid of values. Consequently, various strategies were implemented in this research to maintain objectivity, including the trustworthiness of findings through interpretive summaries. Additionally, we utilized memoing and developed tables and diagrams to visually illustrate the relationships between the constructs and the emerging theory. A detailed discussion of these components will be provided later in this chapter.

Methods

Participant Selection

In a GT study, neither the selection nor the size of the sample is predetermined; instead, the recruitment process persists until the emergence of new categories that fit the data ceases (Glaser & Strauss, 1967; Glaser, 1978). Theoretical sampling was used to obtain participants for this study. Theoretical sampling happens simultaneously with collecting, coding, and analyzing data (Glaser, 1978; Glaser & Strauss, 1967). Theoretical sampling constitutes a form of purposeful sampling in which researchers select participants based on their experiences related to the psychosocial process under investigation. As the study findings emerge, they inform the subsequent selection process (Glaser & Strauss, 1967). As such, the participants were chosen based on the aim to deepen the understanding of having had GDM and now being at risk for or having developed CAD. The initial inclusion criteria for participants for this study were women who: (a) had been diagnosed with GDM and were at risk for or had developed CAD, (b) were able to communicate in English, (c) were over the age of 18, (d) lived in NL, (e) were mentally competent, and (f) were able to understand the purpose of the study.

In this study, the terms "woman" and or “women” are defined as an individual(s) with a uterus and the biological ability to conceive and give birth. This definition is applied strictly to address physiological and reproductive health aspects relevant to the research focus. It is recognized that gender identity is diverse and may not always correspond with biological or reproductive traits. Additionally, it is acknowledged that not all individuals with a uterus identify as women, and that some women may not have a uterus or the ability to give birth.

Moreover, due to the nature of theoretical sampling in GT, the sample size is not predetermined but continues until data saturation is achieved and no new theoretical categories emerge (Glaser & Strauss, 1967; Glaser, 1978). Thus, recruitment continued until no new conditions, properties, categories or patterns in the data emerged (Glaser, 1978; Glaser & Strauss, 1967). A sample size of 20-30 participants is generally sufficient for a GT study (Polit & Beck, 2021). We recruited 26 participants who had a history of GDM and lived in NL. These 26 participants consented to take part in the research study and shared their experiences of having had GDM. The emerging findings did not lead us to conduct interviews or examine the experiences of additional participants. Despite many participants presenting additional risk factors for CAD at the time of the study (e.g., high cholesterol, high blood pressure, angina), only one participant had a confirmed diagnosis of CAD. None of these participants withdrew from the study. It is essential to acknowledge that, although we sought diversity among participants in this GT study, all participants shared similar experiences regarding the care, information, and follow-up they received during their diagnosis of GDM, up to the point of this study. Table 1.1 depicts the demographics for the sample for this study.

Table 1.1

Participant Demographics

Participant Demographics	N (Number of participants)
Age	
18-25	2
26-35	8
36-45	11
46-55	5
Date of Birth of Child/Children	
Last five years	7
Last ten years	10
Over Ten years	9
Education	
In high school	0
Completed high school	26
Post-secondary school	12
Location e.g., community	
Eastern Health	20
Central Health	3
Western Health	1
Labrador-Grenfell	2

The study was conducted in NL and recruitment was carried out through diverse methods. Primary healthcare physicians, cardiologists and nurse practitioners across the province were contacted to discuss the research and its purpose. These HCPs were asked to verbally inform their patients about the study through word of mouth. A script (Appendix A) outlining the research, its purpose, process, and ethical considerations was provided to the HCPs, who agreed to assist with recruitment when recruiting participants. The HCPs then provided the primary investigator (PI), Daisy Baldwin (DB), with the names of interested women, who then contacted these women to explain the study's purpose and process and to obtain informed consent.

Posters (Appendix B) were placed in physician offices, nurse practitioner offices, women's health clinics, cardiologist offices, and community health centers throughout the Regional Health Authorities of NL to provide information about the project and the research team's contact details. An electronic version of this poster was made available to circulate to primary care physicians and nurse practitioners throughout the province. Additionally, the same poster was shared on social media platforms, including Facebook, with the permission of the group administrators. Participants who saw the poster and expressed interest contacted DB. DB then reached out to these participants and described the study using the research study information sheet (Appendix C), outlined the study's purpose, and obtained informed consent (Appendix D).

Furthermore, traditional media were also used as a recruitment strategy, which generated most of the participants for the study. A public service announcement (PSA) for use in traditional media recruitment (Appendix E) was created. The PSA was then sent to media platforms across NL, including radio stations and news centers. Women who heard the PSA and were interested in the study emailed the PI to express their interest, and the informed consent process was followed. Lastly, snowball sampling was also employed, whereby existing research participants recruited other eligible participants for the study through word of mouth.

Data Collection and Analysis

In keeping with an inductive approach in GT, data for this study were collected and analyzed simultaneously (Glaser & Strauss, 1967). The interweaving of data collection and analysis enables the researcher to gain a more comprehensive understanding of the participants' experiences (Glaser & Strauss, 1967). Participants were invited to semi-structured interviews using an interview guide, during which demographic information was also collected (Appendix F). The PI conducted the interviews under the guidance of Dr. April Pike (AP) (PhD supervisor). Each interview lasted between 30 and 70 minutes and was conducted in a private location convenient for the participants. Interviews were conducted via Webex, a secure online platform, over the phone, or in person, depending on COVID-19 restrictions. Follow-up interviews were conducted with two participants to clarify questions raised during the initial interview. Before starting, the purpose of the study and the interview were reviewed, and each participant had the opportunity to ask questions. Written informed consent was obtained before commencing the interviews.

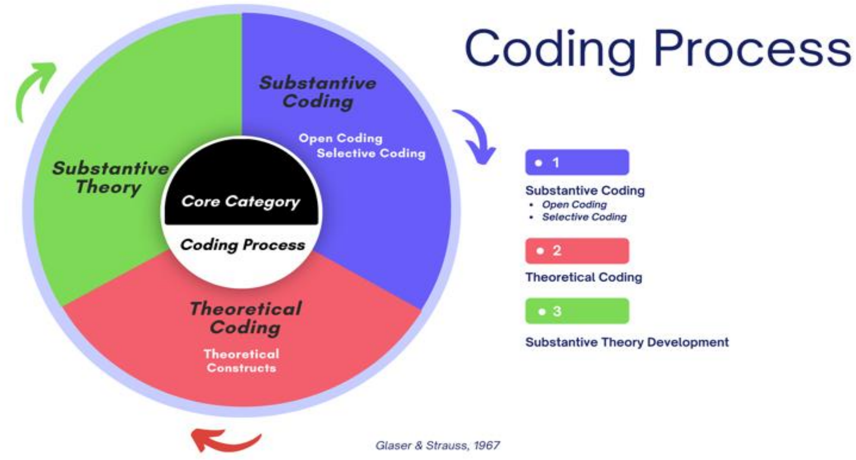
Data were collected through audiotaped, semi-structured individual interviews, which allowed participants to discuss their experiences (Glaser & Strauss, 1967; Polit & Beck, 2021). Audio files were transcribed into written text verbatim by a transcriptionist. The transcribed text was compared to the audio files to ensure the accuracy of the transcript. The audio files were destroyed after transcription. NVIVO software was used to facilitate data storage, management, and analysis. The transcriptions were de-identified immediately and given a unique code. Consent forms, demographic data, and unique identifier codes were stored separately in a locked cabinet in AP’s office at the Faculty of Nursing, to which only AP had access. Transcripts were uploaded to an encrypted password-protected computer. Only DB and AP had access to the contents in the locked cabinet and computer. Other team members only had access to aggregate data. Data will be stored for five years and then destroyed.

For analysis, the constant comparative method was utilized and begins and ends by comparing components of each interview with those in the same interview and with those in every other interview (Glaser & Strauss, 1967). Throughout this process, not only is each aspect of the research evidence meticulously compared, but the researcher also conducts a comparative analysis of available research on the phenomenon of interest (Glaser & Strauss, 1967). Through this process, the theoretical sampling discussed above unfolds, and participants are selected to participate based on the study’s theoretical needs (Glaser & Strauss, 1967).

In addition to the constant comparative method, we used substantive and theoretical coding, memoing, and diagrams, as suggested by Glaser (1978). Data analysis was conducted immediately after the interviews with the PI and supervisor, AP, who had experience conducting GT research. An additional research team member, experienced in qualitative data analysis (KJ), coded each interview separately and collaborated with the PI and supervisor to discuss the findings and reach a consensus on the final codes. The experiences of each participant were compared to account for their diversity and ensure the richness of the emerging theory and credibility of the findings. This was achieved by comparing each interview with all other interviews conducted in the study. An overview of the coding process is presented in Figure 1.1.

Figure 1.1

Coding Process for Data Analysis



Adapted by Glaser & Strauss (1967)

Substantive coding includes open and selective coding (Glaser, 1978). Open coding begins with line-by-line coding of the data to assign preliminary codes or conceptual labels. During this process, we began to look for relationships between participants' narratives or indicators, as the study's overarching concept, "perceiving risk," started to emerge (Glaser, 1978). The indicators in the coding process were formed from raw data, comprising the words, phrases, and sentences directly extracted from the participants' answers. These indicators were compared and clustered together to form concepts that reflect the similarities among the indicators (Glaser, 1978). To facilitate this process, tables were formed with columns for data, codes, and theoretical memoing (Glaser, 1978).

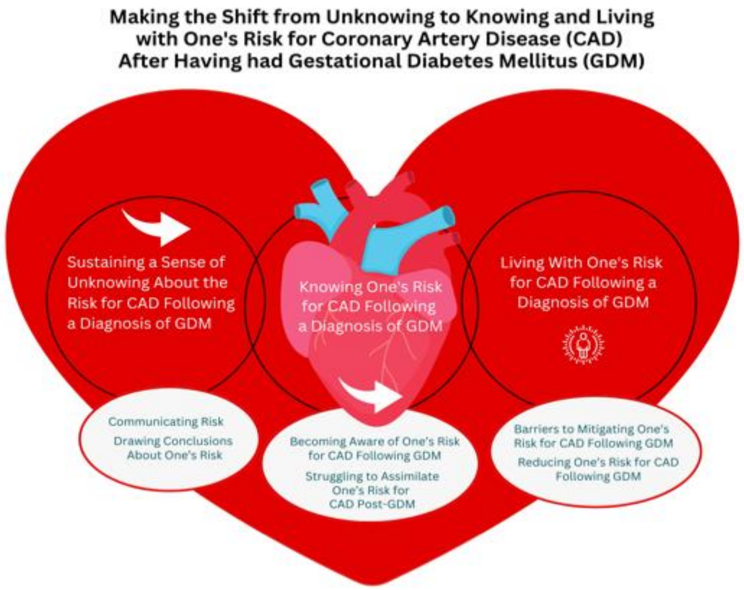
Based on the clustered indicators, the initial conceptual labels were formed. Similarities among the codes or conceptual labels were collapsed into properties. In grounded theory, properties describe the diversity of conditions and dimensions under which conceptual categories occur (Corbin, 1986). Conditions are the factors that influence the property (e.g., age, objective signs, etc.). The dimensions comprise the diverse social context under which the phenomenon of interest unfolds (e.g., during GDM, post-partum period) (Glaser & Strauss, 1967). Properties are combined to form conceptual categories (Glaser & Strauss, 1967). These conceptual categories are described by Glaser & Strauss, (1967) as being “a conceptual element of a theory and reflective of the core category” (p.36). The purpose of substantive coding is for the researcher to form as many of these categories that “fit” the data. This means that the categories emerged from the data, rather than being preconceived notions and ideas (Glaser & Strauss, 1967).

As this coding continued, selective coding for conceptual categories occurred as categories became saturated and the core category became more evident (Glaser & Strauss, 1967; Glaser, 1978). This reduction of categories was undertaken to promote parsimony and enhance the generalizability of the emerging theory (Glaser & Strauss, 1967). The core category in our findings was central to the psychosocial process and occurred frequently across categories. In this case, the core category was “perceiving risk.” The concept of risk, particularly risk perception, continually appeared in how the women described their experiences of how women came to understand and perceive their risk for CAD and the conditions that shaped this perception. Six main categories “fit” the data and contributed to the surfacing of this core category. These six categories were: 1) Communicating Risk, 2) Drawing Conclusions About One’s Risk, 3) Becoming Aware of One’s Risk for CAD Following GDM, 4) Struggling to Assimilate One’s Risk for CAD Post-GDM, 5) Barriers to Mitigating One’s Risk for CAD Following GDM, and 6) Reducing One’s Risk for CAD Following GDM.

Theoretical coding occurs when theoretical links are made between the categories. Once the core category and categories were established, theoretical coding collapsed the conceptual categories into theoretical constructs. The theoretical constructs explain the psychosocial process and form the substantive theory (Glaser, 1978; Glaser & Strauss, 1967). During the theoretical coding process, three theoretical constructs were formed. Categories one and two were linked to form construct one: *Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM*. Categories three and four formed construct two: *Knowing One’s Risk for CAD Following a Diagnosis of GDM*. Lastly, categories five and six were linked to form construct three: *Living With One’s Risk for CAD Following a Diagnosis of GDM*. Considering these three constructs, the process by which women with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD became evident. The substantive theory *Making the Shift from Unknowing to Knowing and Living with One’s Risk for CAD After Having had GDM* emerged. A diagram outlining the study findings can be found in Figure 1.2.

Figure 1.2

Making the Shift from Unknowing to Knowing and Living with One's Risk for CAD After Having had GDM



An overview of the study findings, theoretical constructs, categories, properties, and conditions can be found in Appendix G and detailed in Chapters two, three, and four of this dissertation.

Grounded Theory Research Strategies

Several research strategies were employed to develop and refine the theory based on the data obtained from participants through comprehensive data collection and analysis.

Theoretical Memoing

Theoretical memoing was a critical component of GT as it captured the researchers' evolving ideas about the codes when theorizing about the data, ensuring a clear understanding of the emerging findings (Glaser, 1978). This process begins with gathering data and culminates in the final analysis and confirmation of the theoretical constructs (Glaser, 1978). DB and AP kept separate theoretical memos throughout the coding process. Theoretical memoing was also helpful in identifying ideas or assumptions that may have been made about the study findings and reflecting on the data openly and transparently (Glaser & Strauss, 1967). In this study, theoretical memoing provided the researchers with a space to record thinking and reflect on biases, deepen the understanding of the research topic, findings, and associated literature, consider emerging patterns, document decisions about the research process, and solidify the meanings behind the substantive and theoretical coding that was conducted (Glaser & Strauss, 1967; Glaser, 1978). Theoretical memoing was crucial in developing a well-supported and credible substantive theory. The researchers reviewed the memos and sorted them to put the "opened" data back together in a meaningful way that would capture the psychosocial process of having had GDM and now living with the risk of or developing CAD (Glaser & Strauss, 1967).

Interpretive Summaries

Interpretive summaries enhance the credibility of a GT study by providing researchers with a deeper understanding and solidifying the meanings of the experiences shared by the participants. These summaries were used to ensure that substantive theory emerged without imposition or external influences (Glaser, 1978). Interpretive summaries were written based on each participant's interview to ensure that the emerging theory's development reflected the participant's story and captured their diversity in experiences. Interpretive summaries were sent to all participants via email. Of the 26 participants, 16 confirmed that the interpretive summary did capture their experience. We did reach out to the additional eight a second time, but there was no response. The interpretive summaries provided each participant with an opportunity to add to the summary or to clarify misconceptions. For two participants, a second interview was arranged to clarify slight misconceptions. The summaries were sent back once these interviews were completed to ensure they reflected their experiences.

Diagramming

Diagrams were created throughout the study planning and data analysis stages to illustrate the coding process and to arrange the study findings. While Glaser (1978) does not position diagramming as an essential component of GT, it can be utilized as a personal analytical tool to conceptualize the findings. A diagram was created to map out the steps to coding and the overall substantive theory. The research team also developed an overview of the substantive theory, constructs, categories, properties, and conditions. These diagrams organized the analysis and painted a visual picture of the findings.

Theoretical Sensitivity

Theoretical sensitivity is essential to the GT methodology, requiring researchers to remain open to emerging ideas and then critically review the literature about the study findings (Glaser, 1967). The researchers aimed to be theoretically sensitive throughout the research process. One strategy for achieving theoretical sensitivity was to remain open and flexible throughout the research process (Glaser, 1978). The research team used open-ended questions in their interviews (Glaser, 1978). The researchers also recognized that their current knowledge is not static; understanding evolves. The experiences described by women in this study may not be the same for all women with GDM, given their individual experiences and the potential experiences they may encounter in the future. An initial literature review was completed as part of the PI's PhD work. Morse (2011) states that researchers cannot ignore the existing literature but can bracket what is known to be used for comparisons with data analysis and findings later. With this in mind, the research team began to see the core category emerge from the findings, and the PI returned to the literature to compare the emerging findings with existing literature, validating and refining them. For example, the research team revisited the risk literature as the core category "perceiving risk" was identified, to explore the emerging categories and theory. Therefore, the theory emerged from the data and was not imposed upon (Glaser, 1978).

Trustworthiness

We used the four criteria fit, relevance, work, and modifiability to ensure trustworthiness and rigour in the study (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). Fit is achieved when the developed categories are not forced into preconceived categories based on what the researcher knows and findings in literature (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). Therefore, "the theory must fit the substantive area to which it will be applied and should be induced by diverse data" (Glaser & Strauss, 1967, p.238).

To achieve fit, we employed a post-positivist lens to maintain objectivity throughout the research process while remaining open to the subjective diversity of the cohort. Upon reflecting on the participants' narratives, it became clear that the core category “perceiving risk” fit the data and influenced the psychosocial process. We employed theoretical sensitivity, as discussed above, and utilized theoretical memoing and formed diagrams. Furthermore, to ensure fit, our interpretive framework guided us, namely, the underlying set of ideas and principles that inform and guide one’s perspective and research methodology (Stern and Porr, 2011). We drew on the tenets of symbolic interactionism, pragmatism, and post-positivism to understand how participants’ different beliefs and interpretations about risk were symbolically reflective of their existing reality and relationships. Furthermore, interpretive summaries were provided to the participants to confirm that they reflected their experiences. We employed these measures to ensure that the findings accurately reflected the participants' realities, rather than the researchers’ beliefs and understandings (Glaser, 1978; Glaser, 1992).

Relevance is attained when the established substantive theory emphasizes the fundamental concern that aligns with participants' experiences as grounded in the data (Glaser & Strauss, 1967; Holton, 2008; Lomberg & Kirkevold, 2003). In other words, relevance is achieved by allowing the core process and theory to emerge while avoiding preconceived ideas and theories surrounding the phenomenon of interest. To attain relevance, we employed theoretical sampling and memoing and used the constant comparative method.

Work is accomplished when the substantive theory explains how the phenomenon of interest is addressed. Glaser (1978) asserts, “Work is achieved if the study explains what happened” (p.4). The study's objectives were met through attentive listening to the diverse narratives provided by the participants. We asked questions to ensure that the breadth and depth of their experiences were effectively illustrated. To arrive at a theory that worked, we focused on the conditions that manifested the diversity and variation among the participants, while consistently comparing the data from each participant with that of the others (Glaser, 1978). Based on the findings, we subsequently formulated recommendations to address the issues surrounding women’s risk perception of CAD following GDM, informed by their understanding, management, and experience of this risk. These recommendations will be articulated in the subsequent chapters and represent a step towards enhancing clinical practice and care for this demographic. The findings of this study have also been presented at the Canadian Women’s Heart Health Summit, and experts in the field have stated that this study holds value and can contribute to the limited existing knowledge surrounding adverse pregnancy outcomes. Persons with lived experience attending the conference also noted that the work is relevant to their health experiences and future needs.

Finally, modifiability arises when researchers adapt to participants' variations by considering different ideas and perspectives (Glaser, 1978; Glaser & Strauss, 1967). This involves recognizing the constantly changing relevance and diversity of factors influencing the phenomenon (Lomberg & Kirkevold, 2003). We noted that as more data was collected, the patterns and concepts may be refined, and the categories redefined. We maintained theoretical sensitivity and embraced new ideas and varied responses from participants, utilizing open-ended questions to encourage this (Glaser, 1978). We also acknowledge that insights may differ among women with GDM based on their unique experiences and future encounters. In alignment with this approach, we used pragmatism and symbolic interactionism as our interpretive lens to capture participants' subjective realities.

Ethical Considerations

The Health Research Ethics Board (HREB) at Memorial University of Newfoundland in St John's, NL, granted ethical approval for the study [Application number 2022.038]. We also obtained approval from Eastern Health's Research Proposal Approval Committee, Central Health's Review Committee, Western Health's Research Review Committee, and Labrador-Grenfell Health's Research Review Committee before placing any written materials in their associated facilities. All research team members signed an oath of confidentiality, and those with access to patient data completed the Personal Health Information Act (PHIA) tutorial as directed by the HREB. Written informed consent was obtained before commencing interviews. Participants were informed of any risks and benefits of the study, and that participation was voluntary. Participants were also told that they could withdraw from the study at any time and were encouraged to ask questions. Although no psychological distress was noted during the study, we provided participants with the number at the Mental Health Crisis Line at 1-709-737-4668 and DoorWays, a mental health counselling service offered in person or virtually, province-wide.

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Summary and Overview

The dissertation comprises five self-contained chapters that outline the development of the substantive theory, *Making the Shift from Unknowing to Knowing and Living with One's Risk for CAD After Having had GDM*. This first chapter provides an overview of the research study. The second chapter focuses on Theoretical Construct 1: *Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM* and two categories, Communicating Risk and Drawing Conclusions About One's Risk. Chapter three focuses on Theoretical Construct 2: *Knowing One's Risk for CAD Following a Diagnosis of GDM*, and two categories, Becoming Aware of One's Risk for CAD Following GDM, and Struggling to Assimilate One's Risk for CAD Post-GDM. Chapter four focuses on Theoretical Construct 3: *Living With One's Risk for CAD Following a Diagnosis of GDM* and its two categories, Barriers to Mitigating One's Risk for CAD Following GDM, and Reducing One's Risk for CAD Following GDM. Chapter five is the concluding section, providing an overview of the dissertation and offering recommendations for education, practice, policy, and future research.

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Appendices

Appendix A

Recruitment script for HCPs

Dr. April Pike, Dr. Kimberly Jarvis, Dr. Donna Moralejo, Dr. Martha Mackay, and Daisy Baldwin, a student in the Faculty of Nursing at Memorial University of Newfoundland is conducting a research project called **What are the Experiences of women living in the province of NL diagnosed with GDM and at risk for or develop CAD?** The purpose of the study is to find out more about non-traditional risk factors for coronary artery disease (heart disease) such as gestational diabetes mellitus. This will be achieved through exploring how women come to terms with the fact that gestational diabetes mellitus puts them at risk for heart disease, make health decisions, and live with this risk or disease. They are inviting you to participate in an online or in person interview where you will be asked questions on your experience with living with gestational diabetes mellitus and being at risk for or going on to develop heart disease. Participation will require approximately 60 minutes of your time and will be held via WebEx or in a meeting room in a hospital of a health authority closest to you.

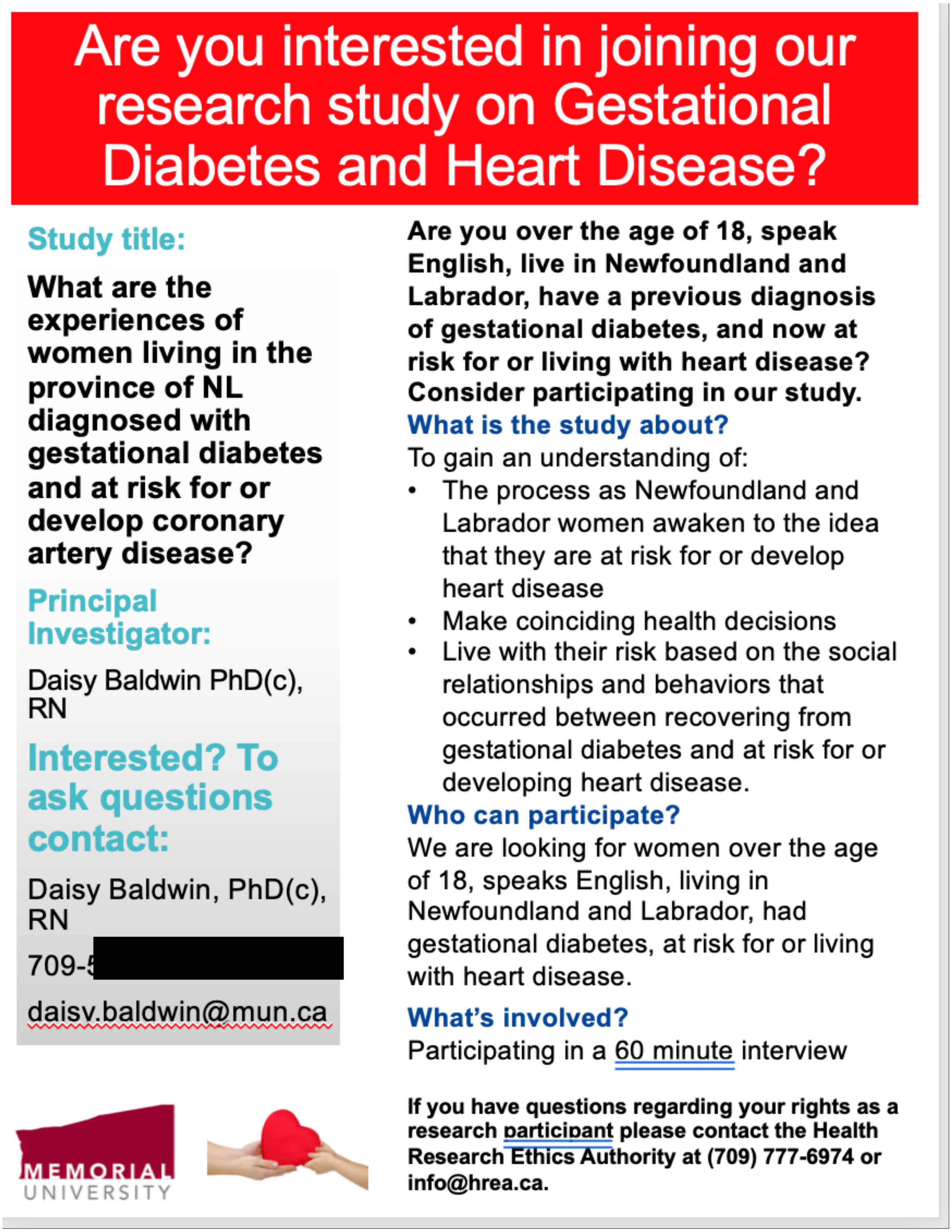
Inclusion criteria for participants in this study will include women who: (a) have been diagnosed with gestational diabetes mellitus and are at risk for or develop CAD within 10 years post-partum, (b) are able to communicate in English, (c) are over the age of eighteen, (d) living in NL, (e) mentally competent, and (f) able to understand the purpose of the study

If you are interested in participating in this study or have any questions about the project, please contact Daisy by email at daisy.baldwin@mun.ca, or by phone at 7095894857.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as your rights as a participant, you may contact the Chairperson of the ICEHR at icehr.chair@mun.ca or by telephone at 709-864-2861.

Appendix B

Recruitment Poster



Are you interested in joining our research study on Gestational Diabetes and Heart Disease?

Study title:

What are the experiences of women living in the province of NL diagnosed with gestational diabetes and at risk for or develop coronary artery disease?

Principal Investigator:

Daisy Baldwin PhD(c), RN

Interested? To ask questions contact:

Daisy Baldwin, PhD(c), RN

709-5[redacted]

daisy.baldwin@mun.ca

Are you over the age of 18, speak English, live in Newfoundland and Labrador, have a previous diagnosis of gestational diabetes, and now at risk for or living with heart disease? Consider participating in our study.

What is the study about?

To gain an understanding of:

- The process as Newfoundland and Labrador women awaken to the idea that they are at risk for or develop heart disease
- Make coinciding health decisions
- Live with their risk based on the social relationships and behaviors that occurred between recovering from gestational diabetes and at risk for or developing heart disease.

Who can participate?

We are looking for women over the age of 18, speaks English, living in Newfoundland and Labrador, had gestational diabetes, at risk for or living with heart disease.

What's involved?

Participating in a 60 minute interview

If you have questions regarding your rights as a research participant please contact the Health Research Ethics Authority at (709) 777-6974 or info@hrea.ca.

Appendix C

Research Study Information Sheet

Research Study Information Sheet for Participants

Why is this research study important?

Coronary artery disease (heart disease) is the leading cause of premature death of Canadian women. In addition, a diagnosis of coronary artery disease contributes to poorer long-term health outcomes in women in comparison to men. These outcomes include increased rates of mortality in the first year following a heart attack, increased hospitalizations, depression, and decreased quality of life. A non-traditional risk factor for coronary artery disease is gestational diabetes mellitus. Gestational diabetes mellitus is on the rise in Canada. Women with gestational diabetes mellitus have a 56% higher risk of developing coronary artery disease than women who did not have gestational diabetes mellitus. Follow up for women with gestational diabetes mellitus is important to adopt appropriate lifestyle changes to reduce the risk and has been recommended in guidelines. However, there is currently no screening for coronary artery disease post gestational diabetes mellitus here in Newfoundland and Labrador. There is also limited literature on how women awaken to the notion that they are at risk for heart disease, how they come to understand and manage their risk for heart disease, and how they live with heart disease.

What is the purpose of this research study?

The overall purpose of this research project is to gain a fuller understanding of the psychosocial process that unfolds as women who are diagnosed with GDM come to understand and cope with their risk for and subsequent management of CAD. This includes how women awaken to the notion that they are at risk for CAD, how they come to understand and manage their risk for CAD, and how they live with CAD.

What will happen during the study and who will be involved?

This is a grounded theory study. Participants will be invited to engage in a semi-structured interview. Inclusion criteria for this study will include women who: Inclusion criteria for participants in this study will include women who: (a) have been diagnosed with GDM and are at risk for or developed CAD within 10 years post-partum, (b) are able to communicate in English, (c) are over the age of eighteen, (d) living in NL, (e) mentally competent, and (f) able to understand the purpose of the study.

How long will it take for this research study to be completed?

Each interview will last approximately 60 minutes at a time and private location convenient for participants. Interviews will also be offered through WebEx, a secure online room in case of any COVID restrictions. A second interview will take place if needed to clarify any parts of the interview or to ask follow-up questions.

What are the benefits of doing this research study?

The findings of this study will be used to help healthcare professionals to develop interventions to address the unique needs of women who had gestational diabetes mellitus and are at risk for or went on to develop coronary artery disease. For example, the creation of education initiatives and screening guidelines, and sex and gender specific cardiac rehabilitation programs.

More information?

Please contact Daisy Baldwin RN, PhD(c), Principal Investigator, Memorial University Faculty of Nursing, 709-589-4857, or daisy.baldwin@mun.ca

Appendix D

Informed Consent Form

Informed Consent Form

MEMORIAL UNIVERSITY

Consent to Take Part in Research

TITLE: What are the experiences of women living in the province of NL diagnosed with gestational diabetes mellitus and at risk for or develop coronary artery disease?

RESEARCHERS: Daisy Baldwin PhD(c), Dr. April Pike, Dr. Kimberly Jarvis, Dr. Donna Moralejo, Dr. Martha Mackay

PHONE NUMBER: 709-xxx-xxxx

SUPERVISOR(S): Dr. April Pike

SPONSOR/FUNDER: Memorial University's Scholarships and Education Exchanges for Development (SEED) Fund

You have been invited to take part in a research study. Taking part in this study is voluntary. You may choose to take part or you may choose not to take part in this study. You also may change your mind at any time.

This consent form has important information to help you make your choice. It may use words that you do not understand. Please ask the researchers to explain anything that you do not understand. It is important that you have as much information as you need and that all your questions are answered. Please take as much time as you need to think about your decision to participate or not, and ask questions about anything that is not clear. You may find it helpful to discuss it with your friends and family. The [researcher/study staff] will tell you about the study timelines for making your decision.

1. Why am I being asked to join this study?

You are being invited to join this study because you are a woman living in Newfoundland and Labrador who has had gestational diabetes mellitus and you are now at risk for or have coronary artery disease (heart disease). Gestational diabetes mellitus is on the rise in Canada. 3.4% of pregnant women in NL will develop gestational diabetes mellitus which is a non-traditional risk factor for heart disease. Newfoundland and Labrador have one of the highest rates of heart disease in Canada. Heart disease is linked to high rates of death, hospitalizations, and poor quality of life in women. This study is being done to find out more information about non-traditional risk factors for coronary artery disease such as gestational diabetes mellitus. This will be achieved through exploring how women come to terms with the fact that gestational diabetes mellitus puts them at risk for coronary artery disease, make health decisions, and live with CAD based on relationships and behaviors that occurred between recovering from gestational diabetes mellitus and becoming at risk for or developing coronary artery disease.

2. How many people will take part in this study?

This study will take place in Newfoundland and Labrador. The study will enroll a total of 20-30 people from Eastern, Central, and Western Newfoundland and Labrador.

3. How long will I be in the study?

You will be expected to enter the online room (WebEx) via computer or by phone for one in-person interview over the next 4 months. Each interview will take approximately 60 minutes. Another second interview may be needed if additional information is required.

4. What will happen if I take part in this study?

If you agree to take part in this study, the following procedures will take place:

Interviews: You will be asked to participate in one to two interviews within the next four months. During the first interview, you will speak with a member of the research team. Each interview will be about 60 minutes. Due to Covid-19 Public Health restrictions the interviews may take place in person at a designated meeting room or through WebEx (a secured, online meeting room). You will be asked to provide information about your experiences with having gestational diabetes mellitus and being at risk for or developing coronary artery disease (heart disease). You can choose not to answer questions if you wish. Based on the findings and need for additional information a second interview may be warranted.

Audio recording used: You will be audio recorded during the interviews. The audio recording will be transcribed (written down) after the interview and will be analyzed by two members of the research team Daisy Baldwin and Dr. April Pike. The transcription will be done by a professional transcription service. Your name or any other identifying information will not be included during the recording, except your voice. The audio recording will be destroyed after it has been transcribed and checked for accuracy.

5. Are there risks to taking part in this study?

During the interview, you may become uncomfortable or experience some anxiety, emotional and/or psychological distress due to the nature of the questions. You can skip questions, take a break, or stop answering at any time. The following resources are available for you to contact for psychological support:

- 24-hour Mental Health Crisis Line 1-888-737-4668
- Newfoundland and Labrador Healthline 1-888-709-2929
- DoorWays 709-752-4903

If your responses indicate that there is a serious risk of harm to yourself or others, confidentiality will be broken to protect you or another person. If we feel that you need urgent care as result of participating in this research study we will intervene according to routine clinical care practices.

Audio Recording:
There is a potential risk of loss of your confidentiality because even though your name will not be part of the audio recording or the transcription, your voice may still be identifiable as your voice. If anyone mentions identifiers (e.g., your name), during the recording, this may identify you.

Inconvenience of time:
There is an inconvenience of time. Each study visit will take about 60 minutes to complete.

Confidentiality risk (for all studies):
Despite protections being in place, there is a risk of unintentional release of information. Researchers will make every attempt to protect your privacy.

6. What are the possible benefits of participating in this study?

There may not be direct benefit to you from taking part in this study.
We hope that the information learned from this study can be used in the future to benefit other women diagnosed with gestational diabetes mellitus through informing clinical practice guidelines and screening to help prevent the development of coronary artery disease (heart disease).

7. If I decide to take part in this study, can I stop later?

It is your choice to take part in this study, participation is voluntary. You can change your mind at any time during the research study. The study team may ask why you are

withdrawing for reporting purposes, but you do not need to give a reason to withdraw from the study if you do not want to. Withdrawal from the study will not have any effect on the care you [or your family, if applicable] will receive. If you decide to leave the study, you can contact your researcher. They will discuss other options with you.
You may fully withdraw from this study. This means that the researcher/study staff will no longer use your data for research and all data collected about you will be destroyed. We will no longer contact you for any reason. Any data that has already been merged with other data and analyzed cannot be destroyed or removed from the study. This is because we have to preserve the study's scientific integrity. However, your data will not be used in future research.
If your participation in this study includes enrolling in any optional studies or long term follow-up, you will be asked whether you wish to withdraw from these as well.

8. What about new information?

It is possible that during the study we will get new information that may affect your willingness to remain in the study. If this happens, you will be notified about the new information in a timely manner. You will be asked whether you want to continue taking part in this study and you may be invited to sign a new consent form, if you decide to continue in the research study.

9. What are my rights when participating in a research study?

Edit as required

You have the right to receive all information that could help you make a decision about participating in this study, in a timely manner. You also have the right to ask questions about this study at any time and to have them answered to your satisfaction.

Your rights to privacy are legally protected by federal and provincial laws that require safeguards to ensure that your privacy is respected.

Signing this form gives us your consent to be in this study. It tells us that you understand the information about the research study. When you sign this form you do not give up any of your legal rights against the study doctor, sponsor or involved institutions for compensation, nor does this form relieve the study doctor, sponsor or their agents of their legal and professional responsibilities.

You have the right to be informed of the results of this study once the entire study is complete. We aim to publish the findings of this study in a credible journal, reveal the findings at conferences such as the Eastern Health Research Symposium and the Women's Heart Health Summit. We also hope that the findings of this study will help inform the development of the Canadian Women's Heart Health Alliance ATLAS which is working towards improving women's cardiovascular health in Canada. There will also be an information session where the research team will discuss the study findings and invite you to attend.

You will be given a copy of this signed and dated consent form prior to participating in this study.

10. What about my privacy and confidentiality?

Study information collected during the study will kept at this site and stored in a secure, locked place that only the study staff will be able to access. After the study closes, study information will kept as long as required by law, which could be 5 years or more. This information will be stored at Memorial University Faculty of Nursing. Daisy Baldwin and her supervisor Dr. April Pike are the people responsible for keeping it secure.

All information that identifies you will be kept confidential, and to the extent permitted by applicable laws, will not be disclosed or made publicly available, except as described in this consent document. Every effort to protect your privacy will be made. Even though the risk of identifying you from the study data is very small, it can never be completely eliminated. If there is a breach of your privacy resulting from your participation in this study you will be notified.

Your access to records

You have the right to see the information that has been collected about you for this study. If you wish to do so, please contact your study doctor.

12. Declaration of financial interest, if applicable

There are no conflicts of interest to declare related to this study.

13. What about questions or problems?

If you have any questions about taking part in this study, you can meet with the principal investigator who is in charge of the study. That person is:

[Daisy Baldwin 709-xxx-xxxx]
[Or you can speak to my supervisor: Dr. April Pike 709-xxx-xxxx]

Or you can talk to someone who is not involved with the study at all but can advise you on your rights as a participant in a research study. This person can be reached through:

Ethics Office at 709-777-6974
Email at info@hrea.ca

Appendix E

Public Service Announcement (PSA)

Memorial University Faculty of Nursing is conducting a research study on gestational diabetes mellitus and heart disease.

They are looking for women over the age of 18, who live in Newfoundland and Labrador, have a previous diagnosis of gestational diabetes mellitus and are now at risk for or living with heart disease.

Those interested in participating in an interview to share their experiences can contact Memorial University's Daisy Baldwin (daisy.baldwin@mun.ca) for more information.

If you have questions regarding your rights as a research participant please contact the Health Research Ethics Authority at (709) 777-6974 or info@hrea.ca

Appendix F

Data Collection Tools

Semi-structured Interview Guide

Thank you for taking your time to do this interview. Before we start I would like to take some time to review the consent form and give you an opportunity ask any questions.

1. Can you please tell me about your experience living with GDM during your pregnancy?

- When did you become aware that you had GDM?
- What did a diagnosis of GDM mean to you? How did you feel when diagnosed with GDM?
- What information did you receive, who did you receive the information from and how? (written material, during a clinic visit, verbally?). What information do you wish you would have had?
- Did you get the support you needed to manage your GDM? Were you monitored post GDM for high sugars or given any education on type two diabetes? Was there follow-up or screening?
- Were you counselled to do lifestyle changes? Were you able to make those changes? Can you please share with me an example? What are some of the barriers and facilitators to making those changes?
- At this time did you have any thoughts about how a diagnosis of GDM could influence your heart health?

2. Could you share with me how you became aware that having GDM puts you at risk for CAD (heart disease)?

- Can you tell me what it was like for you when you learned that you were at risk for CAD? Could you please guide me through your thoughts at this time? What were your immediate concerns/thoughts when you learned that you might be at risk for CAD?
- Who was the first person who alerted you to the fact that GDM is a risk factor for CAD? After this discussion how did your perception of being at risk for CAD change? Where there any particular incidents during your discussions with this individual(s) that comes to mind that impacted your understanding your risk for CAD? Why was this incident so significant?
- Where did you find out this information (e.g., clinic, hospital before you went home, you had a cardiac event)? Were you provided with any information?
- How do you perceive your risk for CAD? Did you discuss your risk for CAD with others (e.g., family, friends)? How did these interactions influence your perception of risk?
- Did this knowledge change your perception of everyday life or how you carried out your activities of daily living?

3. Based on your perception of being at risk for CAD, did you make any lifestyle changes?

- Were you counselled to do lifestyle changes? Were you able to make those changes? Can you please share with me an example? What are some of the barriers and facilitators to making those changes?
- What was your understanding at this time of treatment protocols and recommended screening for as preventive measures for CAD at the time of your diagnosis with GDM?

4. If you were asked to give advice to health care practitioners about how to help women with GDM who are at risk for or have developed CAD what would it be?

<u>Questions 5 -8 are for women who actually have a diagnosis of CAD</u>

5. When you received the diagnosis of CAD how did you feel? How did you cope with the news?

- Could you please guide me through your thoughts at this time? What were your immediate concerns/thoughts when you learned that you have CAD?
- Who did you talk to?
- Where there any particular incidents during your discussions with this individual(s) that comes to mind that impacted your understanding of CAD?
- Why was this incident so significant? What supports did you seek and receive?
- Did you feel that you had adequate follow-up or screening?

6. Have you been provided with any cardiac rehabilitation information or enrolled in a cardiac rehabilitation program?

- If so, do you feel it meets your needs in working towards your cardiac recovery?
- If no, do you feel cardiac rehabilitation would have been beneficial to you? Why or why not?
- Can you provide an example of an aspect of the program that you felt met your needs? or an example that did not meet your needs (i.e., diet, activity)?

7. Do you have any suggestions for future cardiac rehabilitation programs or guidelines for women who had GDM and now diagnosed with CAD?

- What would you like to see included? When should it be given? Who would you like to receive the information from? How?

For all participants

8. Can you share with me how living with the risk for CAD or being diagnosed with CAD has influenced your everyday life?

- How has this experience influenced how you think about your future health?

9. Do you have any concerns regarding barriers to accessing resources or information to help your manage your health?

- How has geography (where you live) impacted your experience?
- What are your thoughts on health care professional's communication skills when discussing your risk for CAD and management of your health?
- Do you have any thoughts on how health care professional support could be improved?
- Can you provide an example of a barrier that you experienced when trying to access resources or manage your health?

10. Is there anything else that you would like to share?

11. Would you like to be part of a patient advisory committee?

Participant Demographics
Unique ID ____________________

Age 18-25 26-35 36-45 46-55	
Date of Birth of Child/Children Last five years Last ten years Over ten years	
Education In high school Completed high school Post-secondary school	
Location e.g. community Eastern Health Central Health Western Health/ Labrador Grenfell	

Appendix G

Overview of Study Findings

Overview of Study Findings

Substantive Theory: *Making the Shift from Unknowing to Knowing and Living with One's Risk for Coronary Artery Disease After Having had Gestational Diabetes Mellitus*

Theoretical Construct 1: Sustaining a sense of unknowing of the risk for coronary artery disease following a diagnosis of gestational diabetes mellitus

- **Category 1:** Communicating Risk
    - Property 1: Receiving the diagnosis of GDM
        - Condition 1: Confirmation of GDM : GTT
        - Condition 2: HCP notification of GDM
        - Condition 2: Large Baby
    - Property 2: Diverse psychosocial responses to being diagnosed with GDM
        - Condition 1: Surprised
        - Condition 2: Frustrated
        - Condition 3: Lack of preparedness
    - Property 3: Lack of knowledge
        - Condition 1: Link between GDM and CAD risk
        - Condition 2: Implications of GDM on future health
        - Condition 3: Education (how and what was provided)
    - Property 4: HCP's Care (during and post-GDM)
        - Condition 1: Follow-up from HCPs
        - Condition 2: Support from HCPs
        - Condition 3: Focus of care (baby's health diagnosis of GDM)
- **Category 2:** Drawing Conclusions About One's Risk
    - Property 1: Objective Risk
        - Condition 1: Age
        - Condition 2: Physical Signs and Symptoms
        - Condition 3: Test Results
    - Property 2: Subjective Risk
        - Condition 1: Delivery of the baby
        - Condition 2: Care and follow-up post-GDM

Theoretical Construct 2: Knowing One's Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

- **Category 1:** Becoming Aware of One's Risk for Coronary Artery Disease Following Gestational Diabetes Mellitus
    - Property 1: Identification of risk for CAD

        - Condition 1: PSA
        - Condition 2: Recruitment poster
        - Condition 3: HCP
    - Property 2: Learning about the risk for CAD
        - Condition 1: Engage in research
        - Condition 2: Psychosocial responses
        - Condition 3: Question prior health information
- **Category 2:** Struggling to Assimilate One's Risk for Coronary Artery Disease Post-Gestational Diabetes Mellitus
    - Property 1: Re-evaluate health status
        - Condition 1: Objective signs and symptoms
        - Condition 2: Subjective perception of risk
        - Condition: Reflection on past health behaviours and care
    - Property 2: Plan to Mitigate Risk for CAD
        - Condition 1: Regimes to mitigate risk
        - Condition 2: Timing of plan
        - Condition 3: Motivators to mitigate CAD risk

Theoretical Construct 3: Living With One's Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

- **Category 1:** Barriers to Mitigating One's Risk for Coronary Artery Disease Following Gestational Diabetes Mellitus
    - **Property 1:** Personal Barriers
        - **Condition 1:** Operationalizing behaviour change
        - **Condition 2:** Family responsibilities
        - **Condition 3:** Work life
    - **Property 2:** Financial Barriers
        - **Condition 1:** High costs of food
        - **Condition 2:** Limited access to medical care
    - **Property 3:** Fragmentation of Care
        - **Condition 1:** Absence of holistic care
        - **Condition 2:** Dismissed care
        - **Condition 3:** Inconsistency among healthcare professionals
- **Category 2:** Reducing One's Risk for Coronary Artery Disease Following Gestational Diabetes Mellitus
    - **Property 1:** Motivators to lower the risk for coronary artery disease
        - **Condition 1:** Re-evaluation of risk status and adoption of healthy lifestyle behaviours
        - **Condition 2:** Familial responsibility

- **Property 2:** Strategies to lower the risk for coronary artery disease
    - **Condition 1:** Screening
    - **Condition 2:** Follow-up
    - **Condition 3:** Monitoring/ advocating for their own health
    - **Condition 4:** Standardized guidelines
    - **Condition 5:** Cohesive interdisciplinary team
    - **Condition 6:** Access to education

Chapter 2: Sustaining a Sense of Unknowing about the Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

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Declaration of Interest: none

Abstract

Background: Gestational diabetes mellitus (GDM) is considered a non-traditional risk factor for coronary artery disease (CAD) in women and is on the rise. The purpose of this grounded theory study (GT) was to gain a fuller understanding of the psychosocial process experienced by women who have had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being.

Methods: This research study was guided by a GT approach. Semi-structured interviews were conducted on women who had GDM and lived in Newfoundland and Labrador (NL). The constant comparative method was used to facilitate data collection and analysis.

Results: The substantive theory that emerged from the study findings was *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. Twenty-six women from NL with a history of GDM and living in NL participated. The theoretical construct *Sustaining a Sense of Unknowing About the Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus* captures participants' experiences as they conclude that they do not have any future health risks once the GDM has resolved. Two categories comprised this process: 1) Communicating Risk, and 2) Drawing Conclusions About One's Risk.

Conclusions: Improved risk communication and education by healthcare professionals about the risk of CAD after GDM are warranted to inform women in NL of their risk for CAD. The findings underscore the importance of clinical practice guidelines and policies in guiding healthcare professionals in promoting proper screening and follow-up for CAD after GDM, thereby helping to mitigate the onset of the disease.

Key words: coronary artery disease, non-traditional risk factor, women, gestational diabetes mellitus, cardiovascular risk

Sustaining a Sense of Unknowing About the Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

Coronary artery disease (CAD) is the most prevalent form of cardiovascular disease (CVD), affecting 126 million people globally (Khan et al., 2020). Timely diagnosis, risk mitigation, and intervention for CAD should be a priority for Canadians since the number of Canadians living with CAD has climbed from 1.5 million in 2001 to 2.4 million in 2018 (Canadian Chronic Disease Surveillance System, 2024; Public Health Agency of Canada, 2016), and the estimated prevalence rate is anticipated to increase by 0.19% by the year 2030 (Khan et al., 2020). Newfoundland and Labrador (NL), the most easterly province in Canada, has a prevalence rate of CAD of 8%, which is close to the national rate of 8.1%, and the highest myocardial infarction (MI) rate in the country, at 2.6%, whereas the national rate is 2.0% (Public Health Agency of Canada, 2018).

CAD is on the rise in women under the age of 55 (Arora et al., 2019; Botly et al., 2020; Jaffer et al., 2021; Norris et al., 2020). This is concerning, given that this cohort has higher mortality rates following MI (Izadnegahdar et al., 2014; Jaffer et al., 2021). Women also experience more psychosocial issues, such as depression, stress, fear, anxiety, sleep disturbances, and altered relationships, in comparison to men (Alyasin et al., 2021; Arora et al., 2019, Botly et al., 2020; Buckland et al., 2019; Colella et al., 2021; Jaffer et al., 2021; Mattina et al., 2019; Prata et al., 2014). Evidence suggests that this increase in CAD may be attributed to the lack of sex-specific research on women and CAD, women’s perceptions that they are at low risk of developing CAD (Berry et al., 2016; Foxwell et al., 2013; Heart & Stroke Foundation of Canada, 2018; Maas &

Appleman, 2010; McDonnell et al., 2014), and a lack of awareness about the signs, symptoms, and potential or actual risk factors for CAD among both women and health care professionals (HCPs) (Andraweera et al., 2022; Berry et al., 2016; Beussink-Nelson et al., 2022; Foxwell et al., 2013; Gooding et al., 2021; Heart & Stroke Foundation of Canada, 2018; Jaffer et al., 2021; Maas & Appleman, 2010; McDonnell et al., 2014; Merz et al., 2017; Moeini et al., 2012; Nielsen et al., 2014).

Women also have both traditional (e.g., smoking, obesity, etc.) and non-traditional risk factors (e.g., pre-eclampsia, gestational diabetes mellitus (GDM), polycystic ovarian syndrome) that contribute to the development of CAD and the associated outcomes. GDM, however, poses a higher risk for future CAD in women than other non-traditional risk factors (Garcia et al., 2016). GDM is a condition of glucose intolerance in which a woman previously undiagnosed with diabetes exhibits high levels of blood glucose (fasting plasma glucose ≥5.3 mmol/L after a 75-gram oral glucose tolerance test) during pregnancy (Chen et al., 2015; Diabetes Canada, 2021; Guariguata et al., 2014). The worldwide prevalence of GDM is 14.7% (Saeedi et al., 2019), and in Canada, the rate is slightly higher at 16.1% (Mussa et al., 2021). Women diagnosed with GDM have a fourfold increased risk of developing CAD in comparison to women who have not had GDM (Garcia et al., 2016). This is worrisome, given that while research has shown that women have limited knowledge of GDM and future health-related risks (e.g., type 2 diabetes, CAD) (Craig et al., 2020; Khooshehchin et al., 2016; Lennon, 2018; Sandsaeter et al., 2019), there is a lack of evidence that captures women's perceptions of their risk for CAD following GDM, and how these perceptions inform their health behaviours.

The purpose of this grounded theory (GT) study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This includes how women awaken to the notion that they are at risk for CAD, how they come to understand, assign meaning to their risk for CAD, how they manage this risk, and how they live with CAD. This paper examines women's experiences as they receive a diagnosis of GDM and starts to explore how to manage their health risks. It captures the interweaving of the conditions that sustain women in a state of unknowing, or lack of awareness, about their risk for CAD as the initial phase of this process. This information is significant because it identifies gaps in existing practices for educating this cohort and highlights the need for future development of clinical practice guidelines that incorporate screening protocols for CAD. We have applied the COREQ checklist for Qualitative Research to confirm that all essential elements of the study process are reported in this article (Tong et al., 2007). The research question was how do women living in the province of NL diagnosed with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD?

Ethical Statement

The research reported in this paper adhered to ethical guidelines. Ethical approval was obtained from the Human Research and Ethics Board of Memorial University of Newfoundland, St. John's, NL [Application number 2022.038]. The authors confirm that informed consent was obtained from all participants prior to conducting the interviews.

Materials and Methods

Study Design

A GT approach guided this research study, as it aims to discover and understand a psychosocial process where little is known about a phenomenon of interest (Glaser & Strauss, 1967). Employing a post-positivist lens with tenets of symbolic interactionism and pragmatism, the researchers acknowledge that although the women did have an actual risk for CAD, participants had undergone diverse experiences and interactions that sustained them in a state of unknowing about their risk. The perception that they were not at risk for CAD shaped coinciding decisions about their health and well-being.

Participant Selection

The team used theoretical sampling in tandem with data collection and analysis. This approach is a form of purposeful sampling where researchers select participants based on their experiences related to the psychosocial process under investigation. New findings may indicate the necessity to include additional participants (Glaser, 1978; Glaser & Strauss, 1967). Hence, the recruitment will proceed until no new conditions, properties, categories, or patterns arise in the data (Glaser, 1978; Glaser & Strauss, 1967). In this study, the participants were women diagnosed with GDM who are at risk for or have developed CAD. The inclusion criteria were women who: (a) had a diagnosis of GDM during pregnancy, (b) were able to communicate in English, (c) were over the age of 18, (d) lived in NL, (e) were mentally competent, and (f) were able to understand the purpose of the study. The emerging findings did not lead us to interview or explore the experiences of any other sample.

The research team recruited participants using diverse methods. Physicians, cardiologists, nurses, and nurse practitioners across NL informed patients about the study and its purpose using a script. If a participant agreed to learn more about the study, the name was given to the principal investigator (PI), DB. The PI contacted potential participants to describe the study and address any inquiries. Posters were displayed in HCPs' offices, women's health clinics, community health centers, and on social media platforms such as Facebook. A public service announcement aired on local NL media outlets. Participants recruited in this way contacted the PI directly and followed the same process outlined above.

Data Collection

Twenty-six semi-structured interviews were conducted via Webex, telephone, or in person in Newfoundland and Labrador from May 2023 to December 2023. Two research team members (DB and AP) carried out the interviews, which lasted between 30 and 70 minutes, in a private space convenient for the participants. AP has experience in GT research. During the interviews, demographic information was collected. All interviews were audiotaped and transcribed verbatim. The transcripts were de-identified and assigned a unique identifier. DB compared all transcribed text with the audio files to ensure the integrity of the data. The audio files were subsequently destroyed. NVivo (13) [2020] Lumivero was utilized to facilitate data storage, management, and analysis (Lumivero, 2023). The transcripts were stored on a password-protected computer that only the PI and AP had access.

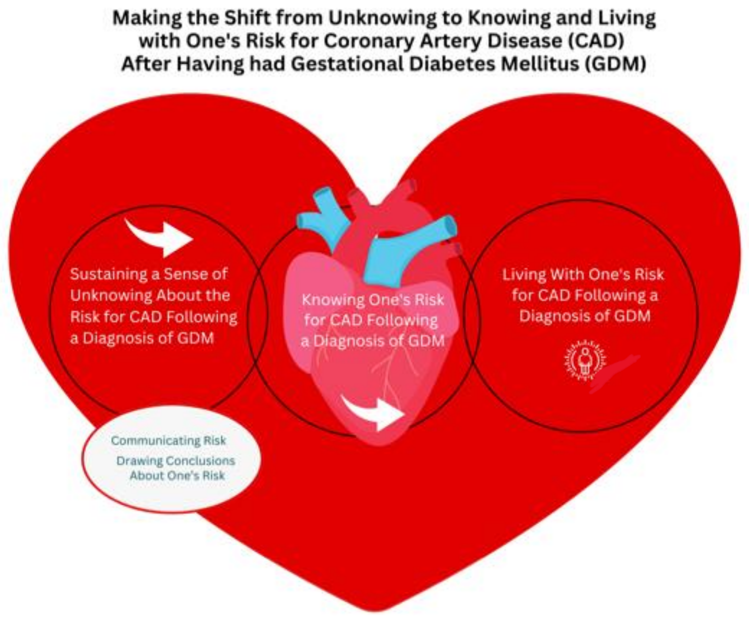
Data Analysis

In GT, data analysis co-occurs with data collection, aligning with an inductive approach (Glaser & Strauss, 1967). By integrating data collection, analysis, and literature review, researchers achieve a deeper insight into participants' experiences (Glaser & Strauss, 1967). The constant comparative method was employed throughout data analysis. This process involves continuously comparing data from each interview to other interviews and data within the same interview (Glaser & Strauss, 1967). This iterative process facilitates theoretical sampling, where participants are selected based on the study's theoretical needs (Glaser & Strauss, 1967).

In addition to the constant comparative method, we used substantive and theoretical coding, memoing, and diagramming (Glaser, 1978; Glaser & Strauss, 1967). Independent data analysis began right after the interview by AP and DB. Another research team member, KJ, independently coded each interview before collaborating to review the findings and finalize the codes. The process starts with substantive coding, which involves open and selective coding. Open coding entails line-by-line analysis of data to assign preliminary codes or conceptual labels. The codes were then collapsed into properties. These properties encompass conditions which reflect the data's diversity. The properties are subsequently integrated and condensed to form conceptual categories (Glaser & Strauss, 1967). Throughout this process, the core category or the central overarching concept of the study emerges (Glaser, 1978). During selective coding, the researcher focuses on coding the core category to saturate the properties and conceptual categories (Glaser & Strauss, 1967). In this investigation, the core category identified was "perceiving risk." Upon establishing this core category, we began theoretical coding, synthesizing the conceptual categories into theoretical constructs. The core category "perceiving risk" is embedded and reflective in these constructs. This process yielded three theoretical constructs that elucidate the psychosocial process, contributing to the substantive theory *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. An overview of the study findings with the three theoretical constructs and categories relevant to the first theoretical construct is presented in Figure 2.1. This paper discusses the findings related to the first theoretical construct.

Figure 2.1

Study Findings



Results

Participant Demographics

A total of 26 women diagnosed with GDM and living in NL participated in the study. Of these participants, 20 were from urban NL, and six were from rural NL. Notwithstanding the presence of numerous participants exhibiting additional risk factors for CAD at the time of the study, such as elevated cholesterol levels, hypertension, and angina, only one participant possessed a confirmed diagnosis of CAD. It is imperative to recognize that, although we endeavoured to achieve diversity among participants in this GT study, all participants shared similar experiences regarding the care, information, and follow-up they received during their diagnosis of GDM, extending from the time of diagnosis to the current point of this study. An overview of the participant demographics is presented in Table 2.1.

Table 2.1

Participant Demographics

Participant Demographics	N
Age	
18-25	2
26-35	8
36-45	11
46-55	5
Date of Birth of Child/Children	
Last five years	7
Last ten years	10
Over Ten years	9
Education	
In high school	0
Completed high school	26
Post-secondary school	12
Location e.g., community	
Eastern Health	20
Central Health	3
Western Health	1
Labrador-Grenfell	2

Study Results

This paper reports the findings of the first theoretical construct, *Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM*. This construct captures participants' experiences that sustained them in a state of unknowing or lack of awareness, given that participants were not informed about their risk for CAD by HCPs. Additionally, participants' primary concern was their risk of developing type 2 diabetes and the baby's well-being. Once they delivered the baby and received a positive, six-week health check-up, they did not perceive themselves to be at risk for any future health problems, including CAD. Hence, most did not engage in activities to mitigate their risk for CAD. Two categories, Communicating Risk and Drawing Conclusions About One's Risk, collectively explain how participants sustained a state of unknowing about their risk for CAD during pregnancy and up to their six-week postpartum check-up.

Communicating Risk

Category one captures how women diagnosed with GDM received their diagnosis and the associated psychosocial and behavioural responses to it. Narratives revealed that despite having a diagnosis of GDM, they were never informed about their risk for CAD, nor did they receive any education on the condition. The healthcare focus had been on managing GDM and the baby's health, rather than their future risk of CAD. These factors had contributed to the women's lack of awareness about their CAD risk and had perpetuated a state of unknowing.

All participants engaged in routine screening throughout their pregnancy, including a glucose tolerance test (GTT) between 24- and 36-weeks' gestation that confirmed a diagnosis of GDM. For many participants, the diagnosis of GDM was confirmed by the GTT test results by an HCP (e.g., obstetrician, family doctor, diabetes nurse educator, nurse practitioner) during a visit to their facility, "*I became aware when they did the test at say, 27 weeks. It [GTT] came back that I had GDM.*" There was one woman, however, who found out she had GDM after the delivery, based on the size of her baby, "*You don't have babies as big as whatever. He [physician] did a test and said I had GDM, but that was all. I never heard anything before or even after.*"

The psychosocial responses or reactions to being diagnosed with GDM included feelings of surprise, frustration, and a lack of preparedness to manage the diagnosis.

Those who described being surprised spoke of not being aware of their risk for GDM, and one questioned how she could have developed GDM when she had no predisposing risk factors, *"I was really surprised, whoa! How did this happen?"* For some, the feeling of being surprised was attributed to the fact that they had tried to maintain a healthy lifestyle throughout the pregnancy, *"I was at the point in my life where I was looking after myself and working out. So, I was really surprised. How did this happen to me*?" For some participants, however, the news of being diagnosed with GDM was met with frustration and anger. *"I was frustrated and angry because I felt fine. But I was angry with why this was happening to me."* Others stated that they did not feel prepared to manage their diagnosis, as they were unsure of what this meant for them and their baby's health. This state of unpreparedness was very stressful as they quickly tried to assimilate this information,

> "*It was something that I wasn't prepared for because I hadn't read up on it or anything like that. So, when they did tell me that I had GDM, it did take a complete toll. I remember walking out through the parking lot crying my eyes out because I didn't know what to expect."*

Similar thoughts were noted in this woman's narrative as she searched for immediate answers as to what this meant for her pregnancy, *"I had a lot of thoughts running through my head that I didn't have answers for. Then I tried to Google. You get both extremes there."*

Although the women had vivid accounts of learning about their GDM diagnosis, none of them recalled being told that they were at risk of having CAD. *"At the time of GDM, I didn't realize all the connections of how my diabetes was a co-*morbidity against

CAD. At that time, I had no knowledge or forward thinking at all." Several women stated that they had no awareness of the implications of GDM for their future health, *"It was not even on my radar. I was under the assumption that as soon as the baby was delivered, the GDM was over. I wouldn't have to worry about it anymore."* Upon reflection, they explained that while they knew about the link between weight gain, family history, hypertension, and CAD, they did not perceive themselves as being at risk for CAD. "*I knew that the GDM could link to type 2 diabetes. If you have the combination of co-morbidities, it would be CAD. But I don't think that at that time, I knew there was a direct link."* A similar view is noted in the following narrative, *"I had a little bit of understanding of diabetes and what it meant and some consequences like kidneys, amputations, sight problems, and so on. I never even considered that, in terms of CAD, no."* For these participants, remaining in a state of unknowing about their actual risk was concerning as they started to realize the implications of having GDM on their health.

Embedded throughout the women's narratives were accounts of the care and education received about their diagnosis for GDM, but not CAD. These experiences varied according to the HCPs designated to their care and the level of support and education provided. While many did receive ongoing care by a variety of members of the interdisciplinary team (e.g., registered nurse, nurse practitioner, dietician, and physician/specialist), *"I was followed by a RN and a dietitian, and an endocrinologist, and my RN would call me weekly to ask me about my diet, what I had eaten, and what my numbers were,"* this was not always the case. For those living in rural regions of NL, the diabetes nurse educator was their main HCP, "*The diabetic nurse educator probably played the biggest role, I would say, making me aware, and other than my doctor, I can't* *say I had a lot of support.*" Others described having no source of support or information from HCPs concerning their GDM and their ongoing risk for CAD, *"I had no information. It was live your life as normal until you get contacted by a dietitian that deals with GDM, and essentially that could take weeks, and just live your life until then."* For some women, living their lives as normal meant they were left on their own to manage their health, *"I was trying to do the best that I could with limited support…I felt like I didn't have time to wait for the dietitian and whatever, so I did whatever I could to figure it out on my own."*

Despite differing levels of HCP support in managing their health, all the women received some education about GDM. The focus of these sessions was related to dietary changes, glucose monitoring, and insulin administration, *"My diabetic nurse just went over what my sugars should be and when I should be checking them."* Information was presented in person, in a group setting, or online. Some women receiving online education highlighted dissatisfaction with this method, *"The diabetic nurse educator sent a link to a Zoom call that ended up not working, and I never got further follow-up. It is not ideal for someone who doesn't know what they are doing."* Others took it upon themselves to look up information that they wanted to know about GDM, *"I did a lot of research on my own and every time if anything came up or I was concerned, I would certainly research it and see what I could find out and I think that kind of satisfied what I needed to know."*

Despite receiving education about their diagnosis of GDM many participants felt that it was the responsibility of the HCP to educate them about their risk for CAD, *"…she [doctor] should have had like pamphlets and explained it to me because she was my* *diabetic doctor so I would assume she would have been the one to give me this information."* Participants discussed the risk of CAD not being part of their management plan. This lack of education was identified as a key condition that sustained women's state of unknowing about their risk for CAD, and for some, impeded their engagement in their own health, *"I was a little shocked that none of the doctors ever mentioned it [risk for CAD] because it would have been nice to know and prepare for and have an idea and be able to watch for it."* Many were of a similar mindset; this was something they should have known, and it was the responsibility of the HCP to inform them of their risk for CAD and any recommended management strategies during their education sessions:

> *"A big percentage of the population doesn't have the skill set to look it up and understand that one system affects other systems, and they all work together. So, for them to take preventative measures, they don't know what they don't know, and the role of the HCP is to try and bring that knowledge to them and piece together those pieces."*

Women's state of unknowing about their personal risk for CAD was cultivated by the fact that their health care journey was focused on the baby's health and the management of their GDM, and not future health risks, *"Well, I was scared for the baby. When I was made aware that I had GDM, it was scary for the child more so than me."* This focus on the baby's health continued into the postpartum period, *"You were so consumed with taking care of the baby and becoming a mother and all that, that I didn't pay attention to it [own health]."* The delivery of a large-for-gestational-age baby resulted from what was considered a healthy pregnancy, *"She was a bigger baby, so I saw that as healthy."* Although participants appreciated that HCPs took their baby's health seriously, upon reflection, they expressed discontent that their health risk was not fully addressed, *"No one cares about the actual mother is my opinion on it all. They only care what was going on with the baby."* The lack of attention to the mother's health contributed to participants' conclusions about their future health risk.

Drawing Conclusions About One's Risk

This category describes the women's experiences as they juxtaposed their objective and subjective perceptions of their health to understand their GDM diagnosis and any future risk for health problems. Through this process, participants concluded they were not at risk for CAD. The focus of participants' risk assessments was on the health of the baby and themselves, specifically, the diagnosis of GDM. However, upon reflection, a few participants did realize that they should have known that they were at risk for CAD, given their family history and the presence of traditional risk factors for CAD.

Women contextualized their perceived risk for GDM with respect to age, physical signs and symptoms, and blood test results. While some women were younger (< 30 years of age, n=15) when diagnosed with GDM, those diagnosed at an older age (> 30 years of age, n=11) referred to their age as putting their pregnancy at higher risk for complications, *"I was really cognizant of trying to look after myself during my pregnancy because I was a bit older."* Although many participants exhibited objective signs of GDM (e.g., thirst, tiredness, light-headedness, weight gain), they did not readily connect these signs and symptoms and their health risk until they had a positive GTT*, "I was very light-headed. I would fall asleep on my desk."* However, some women did question what was happening to their bodies, *"I gained probably 60 to 70 pounds…. and I was like, oh my God, where did all the weight come from."* Despite this, most women did not bring their concerns to their HCPs. One participant did not have any signs of GDM and hence felt that she did not have to be concerned about her health at all, *"I wasn't majorly concerned because there were no symptoms."*

All women underwent routine diagnostic laboratory testing throughout the pregnancy (e.g., pre-natal screen, complete blood count, electrolytes, blood urea nitrogen, and creatinine, thyroid stimulating hormone, ferritin, urinalysis, GTT, and Papanicolaou [pap] test). However, the focus was on the GTT to confirm a diagnosis of GDM. Some women talked about being tested for type 2 diabetes at their six-week check-up, "*Well, the only appointment that I had was the one time, at six weeks, to see if I had diabetes."* There was no mention of being tested for cholesterol levels or lipid profiles in general, despite the weight gain, high sugar levels, and stress during pregnancy. Many other women shared that they did not have any follow-up, *"I had no follow-up after the baby was born*. This lack of follow-up supported the idea that they had no risk of developing health problems. Hence, decisions about their risk and care were limited to GDM.

The delivery of the baby, for most participants, solidified their perception that they no longer had GDM and were in good health. As such, they did not consider themselves at risk for future health complications, "*I was basically told* [by HCP], *you're fine, carry on."* A negative GTT test reconfirmed this perception, *"I had no follow-up. Just basically, your sugars have returned to normal, just carry on."* One woman did question if she needed ongoing care, and she was informed that this was not required: *"After I had the baby, I asked the nurse if I actually had to check my sugars and she told me no, I would be in the clear once they [the baby(s)] were out of my body."* Hence, several women who had actively engaged in healthy behaviors during the pregnancy decided to return to their pre-pregnancy habits, as they were no longer at risk: *"Once my pregnancy was over, I went back to my old ways, but during my pregnancy I stuck to the lifestyle changes that they recommended in the meetings."*

Based on the participants' narratives it was clear that although many women had well known risk factors for CAD, (e.g., type 2 diabetes, weight gain, smoking, high blood pressure, and, for some, a family history of CAD), they did not equate this to being at risk for CAD. Many believed that the preceding signs and symptoms were normal for any pregnancy. It was only in hindsight that participants acknowledged that they should have been more cognizant of their risk for CAD:

> *"I've grown up with grandparents who've had heart disease …. I've always seen it and you know it's kind of always been in the back of my mind that family history is a big risk factor…. But realizing that okay, now guess what, you're at a higher risk …. it kind of sent it home to me that yeah, you know what? You're at risk too."*

The women's conclusion that they were not at risk for CAD was primarily based on the management of GDM and concern for the baby's health. This was reinforced by the fact that HCPs did not inform the women of the traditional risk factors for CAD and that GDM is an additional risk factor. All participants stated that this was information that they should have had to make health care decisions about their future health, *"I don't know if all the doctors are telling them [women], but between my OB and my diabetic doctor, neither one of them mentioned it [CAD] to me. I feel like someone should have, one of them should have, I guess."*

Discussion

The findings capture the experiences of women diagnosed with GDM in NL who are at risk for CAD. Despite clear evidence of the association between GDM and CAD, these women reported that they were unaware of their risk for CAD based on their GDM diagnosis. Consequently, all participants remained in a state of unknowing about their CAD risk. This lack of awareness regarding their CAD risk was attributed to insufficient communication and education from HCPs, as well as both objective and subjective factors that influenced their perceptions of being at risk for future health conditions after GDM, including CAD.

The lack of communication and education about the risk of CAD following GDM by HCPs was a key factor contributing to women's unawareness of their future health risk for CAD. A body of literature has explored CAD risk communication and the positive impact of informing patients about their health risks (Atherton et al., 2018; Bakhit et al., 2024; Hawking et al., 2019; Sebastian, 2004; Schulberg et al., 2022). Authors from a recent systematic review of 62 randomized controlled trials reported that patients who were exposed to communication about their CAD risk were 2 to 3 times more likely to have an increased perception of their health risk compared to those who did not receive any information about their risk (Bakhit et al., 2024). Additionally, those who received information about their CAD health risk engaged in more health-promoting behaviours (e.g., decreased smoking, improved diet, and increased physical activity) than those who did not receive such information, and experienced reductions in blood pressure and cholesterol (Bakhit et al., 2024).

Women have non-traditional, pregnancy-related risk factors that increase the risk for CAD compared to men (Grandi et al., 2019; Graves et al., 2019; Haas et al., 2019; Lane-Cordova et al., 2019; Park et al., 2015; Smith et al., 2013). All the women in this study were at risk for CAD, yet this risk was not communicated to them. The findings of this study align with those reported in the existing literature: women with GDM often receive limited information on the implications of GDM and appropriate follow-up (Craig et al., 2020; Khooshehchin et al., 2016; Lawrence et al., 2019; Sandsaeter et al., 2019). Moreover, evidence suggests that laypersons rely on HCPs, researchers, and networks to form their perceptions of risk and make health decisions (Bostrom, 1997; Davidson, 1991; Lupton, 1999; Lupton, 2023).

The fact that risk is not being communicated and that women do not perceive their risk for CAD is not surprising, as evidence points to the fact that HCPs lack knowledge and understanding of the presentation and risk for CAD in women (Colella et al., 2021; Heart and Stroke Foundation, 2018; Woodward et al., 2019). The Heart and Stroke Foundation (2018) found that, based on a survey of HCPs in Canada, only 22% of physicians and 42% of cardiologists felt prepared to assess CAD in women. Furthermore, women have been underdiagnosed and misdiagnosed due to variation in risk profiles designed for typical male symptoms of a MI (Colella et al., 2021; Woodward et al., 2019). Finally, women do not perceive themselves to be at risk for CAD, despite having risk factors (Beussink-Nelson et al., 2022; Cushman et al., 2021; Gooding et al., 2021; Maas & Appleman, 2010; McDonnell et al., 2014; Moeini et al., 2012). To address these issues, women and HCPs alike must be educated on the risk of CAD following GDM to help increase awareness and ensure this cohort receives timely and appropriate healthcare.

Moreover, women must start to advocate for their health and engage in discussions with their HCP about coinciding health promotion activities during pregnancy (The Canadian Women's Heart Health Alliance (CWHHA), 2023)

The women in our study reported that they often felt the need to find their own resources, including accessing information online. Given the known benefits of communicating CVD risk (Bakhit et al., 2024), our findings are significant given that they point to the need for appropriate communication about one's risk so that women can take and benefit from early interventions and screening. Implementing risk communication tools and education on the risk for CAD should be a part of routine care for this group of patients.

Participants' awareness of their risk for CAD was also influenced by gender roles surrounding women. Participants noted that the focus of care and that of HCPs primarily centred on the baby rather than the woman during pregnancy and postpartum. Experts have highlighted that gender roles, identity, and relations have contributed to women's lack of participation in research, their failure to seek medical attention for cardiovascular health, and decreased levels of engagement in active and healthy lifestyles (Heart and Stroke Foundation, 2018; Jaffer et al., 2021; Norris et al., 2024). The acceptable gender roles and responsibilities, based on an individual's biological or perceived sex, are complex and evolve over time and across cultures. In North America, during the colonial era, women were unable to vote and had limited political rights, which influenced the health priorities established and women's involvement in medical research. Women's struggle for gender equality has now placed them in a situation where they often prioritize family and work over their own health and wellness (Barrett- Connor, 1997; Heart and

Stroke Foundation, 2018; O'Neil, 2018; Pelletier et al., 2016). Additionally, they may overlook signs and preventive measures for CAD due to social norms and expectations, such as balancing caregiver roles with work responsibilities (Pelletier et al., 2016). Our findings, along with related literature on gender and women's perceptions of CAD risk, suggest that HCPs must provide gender-sensitive care to address barriers to seeking help and to ensure optimal care for this group.

Adding to women's lack of awareness about their risk for CAD was the absence of follow-up care and screening. The findings of this study reconfirmed that follow-up for CAD is not occurring in this cohort. The fact that postpartum screening for GDM focuses primarily on type 2 diabetes is concerning, as GDM resolves postpartum but remains a risk factor for the development of CAD, regardless of whether the woman develops type 2 diabetes (Craig et al., 2020; Martis et al., 2018). Adding to this lack of follow-up is the dearth of specific clinical practice guidelines to inform screening, education, and treatment for women at risk for CAD following a diagnosis of GDM. Diabetes Canada (2021) recommendations for follow-up postpartum in women with GDM are very concrete for type 2 diabetes, but not CAD. While there are broad recommendations necessitating the follow-up for women with GDM to reduce the incidence of CAD in both the USA and Canada (Graves et al., 2019; Jasper & Skelding, 2018; Mehta et al., 2015; Poola-Kella et al., 2018; Srivaratharajah & Abramson, 2019), they have not been operationalized. Diabetes Canada guidelines do not contain specific recommendations on when women with GDM should be screened and assessed for CAD and what this screening and assessment should include (Diabetes Canada, 2021; Berger et al., 2019).

The findings of this study indicate that participants lacked information and education about their objective health risks. Although some participants had pre-existing risk factors for CAD, including GDM, this did not result in heightened awareness of their risk. The women noted that they did not perceive themselves as being at risk for any future health issues, including CAD, based on interactions with HCPs. Due to these gaps, women remained unaware of their risk for CAD.

Research in the field of unknowing indicates that together one's idiosyncratic (i.e., personal/subjective) knowledge, and the knowledge acquired from being part of multiple systems (i.e., objective knowledge) help make the shift from unknowing to knowing (Thrift, 1985; Thrift, 1996), or awareness about a situation. Moreover, the distribution of knowledge amongst social groups depends on the provider's expertise. In this study, women concluded they were not at risk for any health conditions post-GDM, including CAD. This personal perception of their (lack of) risk was based on the juxtaposition of objective and subjective knowledge. To provide high-quality care, it is imperative that HCPs ensure that patients have access to all knowledge sources. Additionally, HCPs must strive to establish a trusting relationship with patients. This can help patients become more aware of their health status (Simmel, 1997), including knowledge of their actual risk as they make informed decisions about their health and coinciding interventions (Kornhaber et al., 2016; Kwame et al., 2019; Molina-Mula & Gallo-Estrada, 2020).

Trustworthiness and Limitations

Researchers at GT utilize the four criteria of fit, relevance, work, and modifiability to ensure the study's trustworthiness (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). Fit is achieved when the developed categories are not based on preconceived notions derived from the researcher's knowledge but rather reflect and “fit” the data obtained (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). The theory should align with the specific application area and consider the participants' varied experiences and subjective realities (Glaser & Strauss, 1967, p.238). To ensure this alignment, we employed a post-positivist perspective to maintain objectivity throughout the research process, while remaining receptive to the subjective diversity within the cohort. Reflecting on the participants' narratives, the central category of " perceiving risk" was well-suited to the data and played a significant role throughout the psychosocial process. We also used theoretical sensitivity, theoretical memoing, and diagram formation. Additionally, we provided interpretive summaries to participants and confirmed that those returned to us accurately represented the participants’ experiences (Glaser, 1978; Glaser, 1992).

Relevance is met when the established substantive theory emphasizes the fundamental concern that aligns with participants' experiences as grounded in the data (Glaser & Strauss, 1967; Holton, 2008; Lomberg & Kirkevold, 2003). In other words, relevance is achieved by allowing the core category and theory to emerge while avoiding preconceived ideas and theories surrounding the phenomenon of interest. To attain relevance, we employed theoretical sampling, memoing and utilized the constant comparative method.

Work is met when the substantive theory effectively clarifies the addressed phenomenon. Glaser (1978) remarks, “work is achieved if the study explains what happened” (p.4). We accomplished this by attentively listening to participants' narratives. Open-ended questions were posed to capture the full range of their experiences. To enhance the theory's effectiveness, we focused on conditions that highlighted the diversity and variation among participants, continually comparing the interview data from everyone (Glaser, 1978). Based on these findings, we developed recommendations to address the issues influencing women's perception of CAD risk after GDM, taking into account their knowledge, understanding, management, and experience of this risk. The discussion section outlines these recommendations.

Finally, modifiability arises when researchers adapt to participants' variations by considering different ideas and perspectives (Glaser, 1978; Glaser & Strauss, 1967). This involves recognizing the constantly changing relevance and diversity of factors influencing the phenomenon (Lomberg & Kirkevold, 2003). We maintained theoretical sensitivity and embraced new ideas and varied responses from participants, utilizing open-ended questions to encourage this (Glaser, 1978). We also acknowledge that understanding is dynamic; insights may differ among women with GDM based on their unique experiences and future encounters. In alignment with this approach, we used pragmatism and symbolic interactionism as our interpretive lens to capture participants' subjective realities.

Several study limitations should also be noted. The data were based on a single sample of NL women with GDM. There was only one participant who had gone on to develop CAD after having had GDM. Moreover, despite multiple attempts to enhance recruitment, the majority of participants in the study were from urban rather than rural areas. Therefore, the findings may not be generalizable to rural NL or other parts of Canada and the Western world.

Future Research, Practice, and Education

HCPs must receive appropriate education about women’s CAD and associated sex- and gender-specific risk factors. This includes communicating information to at-risk populations so that they understand their actual risk and can make informed health care decisions. Moreover, our findings underscore the need for further research to inform clinical practice guidelines on the appropriate screening and follow-up for CAD following GDM. Women must be empowered to advocate for their health. The first step is to engage women as active participants in developing clinical practice guidelines for women’s health. It is essential to raise women’s awareness of their risk for CAD following GDM through knowledge translation activities, such as awareness campaigns through the CWHHA, infographics, and health education programs.

Conclusions

This study provides evidence that women who had GDM remain in a state of unknowing about their risk for CAD. The interweaving of two categories (Communicating Risk and Drawing Conclusions About One’s Risk) and associated conditions led women to conclude that they did not have any risk for future problems, including CAD. These findings are significant as they contribute to the existing body of knowledge on the factors that impede women’s engagement in strategies to manage their heart health. Given the high incidence of heart disease among women, the link between GDM and CAD, and the fact that women do not perceive themselves to be at risk for CAD following GDM, it is imperative that HCPs become well-versed in this field. HCPs must be able to discuss with women about their risk and need for follow-up care. Future research must develop clinical practice guidelines and targeted knowledge translation activities to support this role. Women must be equal partners in these activities to ensure that resources reflect their unique needs.

Disclosures

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Chapter 3: Knowing One's Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

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Abstract

Background: Gestational diabetes mellitus (GDM) is recognized as a non-traditional risk factor for coronary artery disease (CAD) in women, and its prevalence is increasing. The purpose of this grounded theory study was to gain a fuller understanding of the psychosocial process experienced by women who have had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being.

Methods: The research study was guided by a grounded theory (GT) approach. Semi-structured interviews were conducted on women who had GDM living in Newfoundland and Labrador (NL). The constant comparative method was used to facilitate data collection and analysis.

Results: Twenty-six women with a history of GDM and living in NL participated in this GT study. The substantive theory that emerged from the study findings was *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. This article presents the findings from the second theoretical construct, *Knowing One's Risk for CAD Following a Diagnosis of GDM*. Two categories, (1) Becoming Aware of One's Risk for CAD Following GDM and (2) Struggling to Assimilate One's Risk for CAD Post-GDM, describe the moment when women recognized their risk for CAD and began to process its implications for their healthcare trajectory.

Conclusions: The above theoretical construct, derived from the two categories, collectively explains the moment when women acknowledged their risk for CAD and began processing what this meant for their health trajectory. Our findings demonstrate that the psychological safety of research participants must be considered and monitored throughout the entire research process, from recruitment to completion. Additionally, we recommend that research participants play an active role in research that involves their own health and future healthcare practices. Finally, since healthcare professionals (HCPs) are considered experts in the field by their patients, HCPs must be educated and prepared to translate knowledge on the risk of CAD to this cohort and to provide support, as women who had GDM were not aware of their risk for CAD and asked for HCPs' support in the interviews.

Key words: coronary artery disease, non-traditional risk factor, women, gestational diabetes mellitus, cardiovascular risk

Knowing One’s Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

Coronary artery disease (CAD) is the most common cardiovascular disease (CVD) globally (Garcia et al., 2016; Heart and Stroke Foundation of Canada, 2024; Shahjehan & Bhutta, 2023). Approximately 126 million people worldwide are affected by CAD (Khan et al., 2020). Newfoundland and Labrador (NL) have higher mortality rates from CAD than other Canadian provinces (Health Accord NL, 2022). Contributing to this is the province's myocardial infarction (MI) rate, which at 2.6% is higher than the national average of 2.0% (Public Health Agency of Canada, 2018). Moreover, CAD is the leading cause of premature and preventable deaths in women (Heart and Stroke Foundation, 2024). Given these facts, prioritizing CAD mitigation in women is crucial for the province of NL.

Over the past 10 years, there has been an upward trend in CAD diagnosis and hospitalizations in Canada among women under the age of 55 (Arora et al., 2019; Botly et al., 2020; Jaffer et al., 2021; Norris et al., 2020). This group also experiences worse health outcomes related to CAD in comparison to men including higher post-MI mortality rates, longer recovery rates, and increased rates of psychosocial issues such as depression, stress, fear, anxiety, sleep disturbances, and altered relationships (Alyasin et al., 2021; Arora et al., 2019; Botly et al., 2020; Colella et al., 2021; Garcia et al., 2016; Jaffer et al., 2021; Mattina et al., 2019; Mehta et al., 2016; Norris et al., 2020). Despite these adverse health outcomes, many women underestimate their risk of developing CAD (Berry et al., 2015; Foxwell et al., 2013; Heart & Stroke Foundation of Canada, 2024; McDonnell et al., 2014; McDonnell et al., 2018). For example, McDonald et al. (2014) found in a survey of 1,654 people that 60% of women at high risk for CAD, based on having traditional risk factors, perceived their risk as low.

Adding to women's perceptions that they are not at risk for CAD is the lack of sex-specific research in this area, lack of awareness of CAD symptoms among women, and health care professionals' (HCPs) inadequate knowledge of the risk of CAD in women (Andraweera et al., 2022; Bairey Merz et al., 2017; Berry et al., 2015; Beussink-Nelson et al., 2022; Colella et al., 2021; Gooding et al., 2021; Jaffer et al., 2021; McDonnell et al., 2014; Mulgavh et al., 2024; Nielsen et al., 2022; Norris et al., 2024). Compounding these issues are women's unique, sex-specific risk factors for CAD. Alongside traditional risk factors such as obesity, smoking, physical inactivity, and high cholesterol, women also face non-traditional, pregnancy-related risks, including gestational diabetes mellitus (GDM), preeclampsia, and eclampsia.

There is increasing evidence of a link between GDM and the risk for CAD development up to 25 years postpartum (Chen et al., 2024; Kramer et al., 2019; Minhas et al., 2024; Norris et al., 2024). GDM is a form of glucose intolerance in which a woman with no previous diagnosis of diabetes develops the condition during pregnancy (Diabetes Canada, 2021). Women with a history of GDM face a 56% higher risk of CAD and a fourfold increased risk of MI (Diabetes Canada, 2021; Garcia et al., 2016; Green, 2021; Kramer et al., 2019). These findings underscore the need for targeted risk-reduction strategies, as GDM significantly elevates lifetime CAD risk (Fu & Retnakaran, 2022). However, despite recommendations, there are no standardized clinical practice guidelines for screening or follow-up education for this high-risk group (Diabetes Canada, 2024). Furthermore, research on women's risk perceptions and health behaviours related to CAD following GDM remains limited. This information is crucial to ensure that women diagnosed with GDM accurately understand their risk of CAD and that HCPs are prepared to engage in dialogue with this cohort about their actual risk, including risk reduction strategies.

The purpose of this grounded theory (GT) study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This paper examines the point in the trajectory when women with GDM became aware of the risk for CAD and started to assimilate what this meant for their health. The findings contribute to the existing body of knowledge about the factors that shape women's perception of their risk for CAD and coinciding healthcare decisions. Furthermore, we discuss the potential impact of research recruitment strategies on prospective research participants. We employed the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist for Qualitative Research to guarantee that all essential study process elements are reported in this article (Tong et al., 2007). The research question was how do women living in the province of NL diagnosed with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD?

Ethical Statement

The Human Research and Ethics Board of Memorial University of Newfoundland, St John's, NL [Application number 2022.038] granted ethical approval for the study. All participants gave informed consent before the research interviews were conducted.

Materials and Methods

Study Design

The research team utilized a GT design for this research study. GT is used to discover and understand a psychosocial process or patterns of behaviours where little is known about the phenomenon of interest (Glaser & Strauss, 1967). There is a dearth of literature that captures women's perception of their risk for CAD following GDM. Using a GT approach, the researcher can identify conditions that capture variations and diversity in participants' experiences that unfold within the nexus of their everyday lives and social interactions (Glaser & Strauss, 1967). The research team utilized a post-positivist lens with tenets of pragmatism and symbolic interactionism as we acknowledge that, while the women in this study are at risk for CAD, they also have diverse experiences, values, and interactions that contributed to how they came to know and process the fact that the risk for CAD exists.

Participant Selection

The team employed theoretical sampling concurrently with data collection and analysis. Theoretical sampling is a type of purposeful sampling in which researchers select participants based on their experience with the psychosocial process being investigated, and as emerging findings identify the need for additional participants to be brought into the study (Glaser, 1978; Glaser & Strauss, 1967). Thus, recruitment continued until no new conditions, properties, categories or patterns in the data emerged (Glaser, 1978; Glaser & Strauss, 1967). As researchers using this sampling method, participants were chosen to deepen our understanding of this process. In this case, the participants under investigation for this study were women diagnosed with GDM who are at risk for or who developed CAD. The research team recruited using diverse methods. The inclusion criteria were women who: (a) had a diagnosis of GDM during pregnancy, (b) were able to communicate in English, (c) were over the age of 18, (d) lived in NL, (e) were mentally competent, and (f) were able to understand the purpose of the study. The emerging findings did not lead us to interview and explore the experiences of any other sample.

Posters were distributed in HCPs' offices, women's health clinics, community health centres, and social media platforms like Facebook. A public service announcement (PSA) was developed and broadcast on local NL media platforms, including radio, television, and newspapers. Additionally, scripts were provided to physicians, cardiologists, nurses, and nurse practitioners across NL to inform their patients about the study. Interested individuals could express their interest in two ways: their names could be forwarded to the principal investigator (PI), DB, by an HCP, or they could directly contact the PI using the information provided on the posters and PSA. The PI subsequently explained the study and clarifed any concerns or questions.

Data Collection

Twenty-six semi-structured interviews were conducted via Webex, telephone, or in person in Newfoundland and Labrador from May 2023 to December 2023. These interviews lasted 30-70 minutes. Two research team members (DB and AP) conducted semi-structured interviews in a convenient, private location selected by participants. AP has expertise in GT research. During the interviews demographic information was collected. All interviews were audiotaped and transcribed verbatim. To ensure data integrity, DB reviewed all transcriptions against the original files. Once verification was complete, the audio files were destroyed. NVivo (13) [2020] Lumivero was used to facilitate data storage, management, and analysis (Lumivero, 2023). The transcripts were kept on a computer secured with a password, accessible only to the PI and AP.

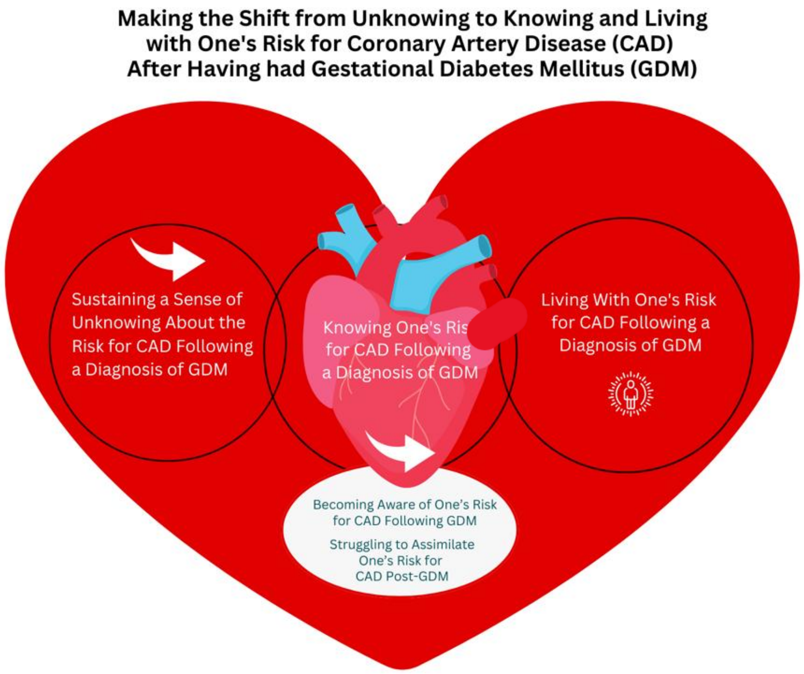
Data Analysis

Following an inductive approach in GT, data analysis took place concurrently with data collection during the study (Glaser & Strauss, 1967). By merging data collection and analysis, the researcher gains a comprehensive understanding of participants' experiences (Glaser & Strauss, 1967). The constant comparative method was used throughout the data analysis. The constant comparative method begins and ends by comparing the data from each interview with that from every other interview and the data from the same interview (Glaser & Strauss, 1967). This process facilitates theoretical sampling, which involves selecting participants based on the study's theoretical needs (Glaser & Strauss, 1967).

In addition to the constant comparative method, substantive and theoretical coding, memoing, and diagramming were employed (Glaser, 1978). Independent data analysis occurred immediately after the interviews by AP and DB. AP has experience conducting GT research. An additional research team member, KJ, coded each interview separately and then collaborated to discuss the findings and assign final codes. Substantive coding occurs first and includes open and selective coding. Open coding entails line-by-line analysis of data to assign preliminary codes or conceptual labels. The codes were then collapsed into properties. These properties encompass conditions which reflect the data's diversity. The properties are subsequently integrated and condensed to form conceptual categories (Glaser & Strauss, 1967). Throughout this process, the core category or the central overarching concept of the study emerges (Glaser, 1978). During selective coding, the researcher focuses on coding the core category to saturate the properties and conceptual categories (Glaser & Strauss, 1967). In this investigation, the core category identified was “perceiving risk.” Upon establishing this core category, we began theoretical coding, synthesizing the conceptual categories into theoretical constructs. The core category “perceiving risk” is embedded and reflective in these constructs. This process yielded three theoretical constructs that elucidate the psychosocial process, contributing to the substantive theory *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. An overview of the study findings with the three theoretical constructs and categories relevant to the second theoretical construct, is presented in Figure 3.1. This paper reports on the findings of theoretical construct two.

Figure 3.1

Study Findings



Results

Participant Demographics

The study involved 26 women diagnosed with GDM and living in NL. Ten were from urban NL and six were from rural NL. Although several participants exhibited extra risk factors for CAD during the study (such as high cholesterol, high blood pressure, and angina), only one individual had a confirmed CAD diagnosis. It is essential to recognize that, while aiming to capture the diversity of participants' experiences in this GT study, all participants shared similar experiences regarding the care, information, and follow-up received during their GDM diagnosis up to this point in the study, regardless of whether they developed CAD or not. The demographic characteristics of these participants are listed in Table 3.1.

Table 3.1

Participant Demographics

Participant Demographics	N
Age	
18-25	2
26-35	8
36-45	11
46-55	5
Date of Birth of Child/Children	
Last five years	7
Last ten years	10
Over Ten years	9
Education	
In high school	0
Completed high school	26
Post-secondary school	12
Location e.g., community	
Eastern Health	20
Central Health	3
Western Health	1
Labrador-Grenfell	2

Study Results

This paper will report the findings of the second theoretical construct, *Knowing One's Risk for CAD Following a Diagnosis of GDM*. Two categories, (1) Becoming Aware of One's Risk for CAD Following GDM and (2) Struggling to Assimilate One's Risk for CAD Post-GDM, describe the moment when women recognized their risk for CAD and began to process its implications for their healthcare trajectory.

Becoming Aware of One's Risk for CAD following GDM

This category describes the conditions under which participants identified and learned about their risk for CAD and their coinciding psychosocial responses. All participants became aware of their risk for CAD as a result of being diagnosed with GDM when they received an invitation to participate in this research study. This included the one participant who went on to develop CAD. Most participants learned about the study via a media PSA, *"... your article on the news* [PSA] *was the first time I heard about the risk for CAD….. It woke me up quite a bit, actually."* This PSA evoked feelings of surprise for some women, as they were unaware of the link between GDM and CAD, *"Your article [PSA] on the news alerted me to the fact that GDM and heart disease are linked. There was no mention of it prior and I was sitting there like what?"* For others, it was the recruitment poster displayed through social media (e.g., Facebook and Instagram) that raised participants' awareness as to their risk, "*Your study was shared amongst Facebook and that's the first time I ever heard of it [the risk for CAD post GDM]."* Two women were recruited to participate in the study via their HCP, and for them, this encounter was their first inkling of their risk for CAD post GDM, "*My diabetic nurse told me about the study and asked if I wanted to participate."*

The awakening that they were at risk for CAD prompted several women to engage in their own research before the research interview. Participants wanted to learn more about their risk and what this meant for their health, *"I was like crap! This is something I don't know. No one told me about it. Now, I must go look it up and read about it and find actual information that is helpful and not made-up stuff."* For others, this started conversations with their family about their risk, hoping they could understand what this meant for them and their families, *"I spoke to my husband about it [risk CAD].*"

For many, learning more about their CAD risk was a key motivator for engaging in the research study. Several women stated that having the information to make informed decisions about their health was important, "*I would like to know more. I am the kind of person who likes to know the information up front to make an informed decision."* Multiple participants, however, stated that the recruitment materials evoked feelings of stress that prompted them to engage in the research study, *"I find it [the risk for CAD] distressing. I want to know what I can do to prevent it; I think more than anything, I'd like to be able to try to do what I can to avoid it."* For one woman, who developed CAD post GDM, learning about the study sparked a sense of curiosity, *"I read about different studies and things like that, but I usually don't get involved in them. But when I read this, I was curious… I'd like to find out more because that's me, what happened to me."* For others, the motivation to engage in the study was to have a fuller understanding of their risk for CAD and what it meant for them, *"It was kind of a weird feeling to think that something that you thought was a risk at the time to your baby would be a risk for me. I wanted to know more about it."*

As the women became aware of their risk for CAD, they questioned why they were not privy to this information during their healthcare trajectory, specifically, why this discussion was not part of their plan of care, "*No one ever made a correlation or suggested there could be a link or there was never any discussion."* This was also true for those participants with a healthcare background, *"I never really thought much about it until I started to read your study. I was like, oh my God! Yeah, I mean, I should have* *known because I'm a [HCP]…."* For one participant in the health care profession, this lack of knowing about their risk was justified given that this information was not taught in school, "*I hauled out my old textbooks…I did not know that [the risk for CAD post GDM] until I read that in the paper that I found the [research]call-out for in. So that's new to me."*

Struggling to Assimilate One's Risk for CAD Post-GDM

Knowing one's risk for CAD prompted participants to rethink what this meant for their health. As they began this process, many women reassessed whether they had objective signs of CAD as benchmark data to evaluate and understand their current health. While some accepted that they were at risk for CAD, others were not so readily convinced that this was something they needed to be concerned about or required any behavioural changes. Overall, the perception of being at risk for CAD was a result of participants' personal risk assessment in consideration of the signs and symptoms of CAD.

The shift from unknowing to knowing about one's risk for CAD unfolded as the women started to assimilate this knowledge in consideration of the presence or absence of objective signs or symptoms of CAD. Those women who had no objective signs or traditional risk factors for CAD struggled with accepting their actual risk, based on their risk assessment of their health status, *"I certainly wondered, where is this coming from? Why did this come out of the blue at a fairly young age, like 50, and I'm an active walker and not a big person, not overweight, all those types of things."* Those women who did have objective signs of CAD could easily rationalize their increased risk status, *"I was diagnosed with hypertension, it was always in the back of my mind that it could* *contribute to a heart attack or stroke."* However, what remained puzzling was the association between a diagnosis of GDM and risk for CAD*, "I know I am at risk for heart disease because I am an ex-smoker, my diet is not perfect, and I have high cholesterol, but I never deduced that it had anything to do with having GDM."* Adding to their perception that they were not at risk for CAD was the fact that HCPs did not inform the women about their identified risk, *"I actually did develop high blood pressure around 15 years ago and no one ever made a correlation or suggested there could be a link."*

As the women struggled to make sense of their risk status, they reflected on their past health behaviours and questioned their role in increasing their risk for CAD, *"I wonder if I am doing everything right? Is there something wrong with me I don't know? It can be all-consuming at times."* Efforts to understand their risk were often met with feelings of concern as to their personal health care trajectory, *"You feel like a time bomb. You're going along every day, and you know that there is something [the risk for CAD]."* For one woman, knowing that she was at risk for CAD caused significant distress. Any physical signs and symptoms perceived to be associated with a heart problem was equated to a heightened sense of risk that warranted medical attention, *"I am more conscious of any discomfort that I feel in my chest, the first thing that comes to mind is oh my, I've had GDM, I suppose now that there is not something going on with my heart?"* Participants felt that getting the proper information about their risk status was critical in helping them move forward and engage in activities to mitigate their risk. However, lack of access to HCPs was a barrier, *"It is getting harder and harder to see the family doctor. It takes two months to get an appointment."* For those living in rural regions of the province, access and travel to HCPs posed an issue, "*It is very difficult in a rural area trying to come up with time to travel for appointments."*

As women started to assimilate knowledge of their risk for CAD, including what this meant for their life course trajectory, they discussed a potential plan to mitigate their risk. This plan included incorporating regimens to engage in a healthy diet and exercise regimen, *"I would say that my number one priority now would be to shed some pounds, lose some weight, and I'm hoping that would improve my cardiovascular health."* For some, strategies to reduce one's risk for CAD were in place immediately following exposure to the research recruitment materials, *"Well, I try to live a lot healthier lifestyle [exercise more] than I did, so the information pushed me to say, okay, wait now, I need to stay on track."* The impetus to make healthy behaviour changes was also reflected in comments that captured participants' desire to see their children grow up, *"My children are nearly four, almost five, so, of course, I want to be around as long as possible, anything I can do to benefit myself and reduce the risk I will."*

Discussion

This study captures the experiences of women diagnosed with GDM in NL as they became aware of their risk for CAD and started to assimilate this information into the context of their everyday lives. Three key components of the study findings have implications for making recommendations to guide HCPs in conducting research and providing care for at-risk populations: (1) Women learned about their risk for CAD following GDM only when invited to participate in this research study, (2) Women diagnosed with GDM require education and concurrent support from HCPs regarding their risk for CAD, and (3) HCPs lack appropriate education about women's increased risk for CAD following GDM.

All women learned about their increased risk for CAD post-GDM when they were invited to participate in this study, rather than from an HCP. This finding highlights the significant impact that recruitment strategies and accompanying materials can have on the psychosocial and behavioural responses of at-risk populations. For many individuals, the invitation to engage in research is the first acknowledgement that they may be at risk for a health condition and can result in diverse responses. In this study, participants reported being surprised by their risk status and experienced stress related to the uncertainty of what this meant for their health. Therefore, when conducting research, researchers must consider the preceding factors in the research design, particularly recruitment strategies and related materials. In some instances, researchers may need to mitigate participants' psychosocial responses to such new information in the recruitment phase. The Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2) states that researchers must monitor safety and ensure appropriate plans are implemented if any threat to participant safety arises (Canadian Institutes of Health Research et al., 2022). Similar statements are outlined in the Declaration of Helsinki (2024), which emphasizes that minimizing risks and burdens to participants should be imperative, regularly monitored, assessed, and documented by the researcher throughout the research process (World Medical Association, 2024). Despite this, the literature is limited in examining the potential impact of recruitment materials on the health and well-being of possible participants (Gyure et al., 2015). As such, further research is necessary to fill this knowledge gap.

Given participants' responses to our initial research recruitment materials, this study serves as an example of the importance of having safety monitoring and an implementation plan readily available in the research plan (Canadian Institutes of Health Research et al., 2022). Based on our findings, this plan should commence early, during the dissemination of recruitment materials, before the consent process. For example, any posters, PSAs, or social media postings should reference readily available resources to mitigate any psychosocial distress participants may experience. Although we did not include this information in our study recruitment methods, it was part of the informed consent process. Attention to include these important details will be of utmost importance for future research that we conduct. We further recommend that research ethics boards continue to employ existing guidelines for research recruitment materials to reduce the potential negative responses from research participants.

Our findings also demonstrate that recruitment materials motivate research participants and function as a strategy for knowledge mobilization. In this study, participants expressed a desire to learn more about their risk for CAD immediately after being exposed to the recruitment materials. Consequently, many sought additional information to help them understand what this meant for their health. Similar responses have been noted in the risk literature that examines the experiences of individuals at risk for a health condition. One's perception of risk fluctuates in response to one's experiences, knowledge, and exposure to a health threat (Lupton, 1999; Manuel, 2015). For example, individuals exposed to information about a potential adverse health outcome develop a heightened sense of risk and are more willing to engage in health behaviours to mitigate that risk (Ferrer & Klein, 2015; Radcliffe & Klein, 2002).

The findings of this study stress the significant role that HCPs can play in helping at-risk populations assimilate and manage their risk status across their lifespan. Our participants had been of the mindset that the link between GDM and CAD was non-existent and that it was the responsibility of the HCP to bridge this gap. This includes HCPs providing education and coinciding support for women who had GDM. One way to achieve this is for HCPs to help women evaluate their objective risk compared to their subjective perception of their risk for CAD. The risk literature indicates that lay people regard HCPs as experts. Thus, they depend on the HCP to inform them about their actual risk, help them understand what this means for their healthcare trajectory, and guide them in managing their risk (Lupton, 1999; Manuel, 2015). Like other research examining women's awareness of their CAD risk, this study found that HCPs did not engage with participants about their risk for CAD (Clavel et al., 2024; McDonnell et al., 2014; Mulvagh et al., 2024; Norris et al., 2020).

Research suggests that HCPs should provide their patients with the complete picture of their actual risk status, including their life course risk (Fu & Retnakaran, 2022). Nonetheless, evidence points to the fact that HCPs themselves lack knowledge and understanding of the presentation and risks for CAD in women, and this has often led to underdiagnosis and misdiagnosis (Colella et al., 2021; Heart and Stroke Foundation, 2018; Woodward et al., 2019). Therefore, for HCPs to provide the proper education on GDM as a risk factor for CAD, they too will require specific education and training to address their knowledge deficits and inaccurate perceptions of CAD risk in women. (Adreak et al., 2024; Clavel et al., 2024; Norris et al., 2024). This includes initiating education on the risk for CAD following GDM in post-secondary programs such as nursing and medical schools (Adreak et al., 2024; Brijmohan et al., 2021). These early education initiatives for HCPs can be coupled with the development of core modules and case studies on the risk for CAD following GDM for nurses, nurse practitioners, primary care professionals, and obstetricians (Adreak et al., 2024; Norris et al., 2020; Quansah et al., 2024).

Trustworthiness and Limitations

GT researchers use the four criteria, fit, relevance, work, and modifiability, to ensure trustworthiness in the study (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). Fit is achieved when the developed categories are not based on preconceived notions derived from the researcher's knowledge, but rather reflect the data obtained (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). The theory must fit the substantive area to which it will be applied and should consider participants' diverse experiences and subjective realities (Glaser & Strauss, 1967, p.238). To achieve fit, we used a post-positivist lens to maintain objectivity throughout the research process while still being open to the subjective diversity of the cohort. Upon reflecting on the participants' narratives, it became clear that the core category “perceiving risk” fit the data and influenced the psychosocial process. The authors employed theoretical sensitivity by reviewing existing literature to identify and connect emerging concepts and patterns, and to avoid biases through techniques such as theoretical memoing and creating diagrams as a visual representation of the data. Furthermore, interpretive summaries were provided to the participants to confirm that they reflected their experiences. We employed these measures to ensure that the findings accurately reflected the participants' realities, rather than the researchers’ beliefs and understandings (Glaser, 1978; Glaser, 1992).

Relevance is attained when the established substantive theory emphasizes the fundamental concern that aligns with participants' experiences as grounded in the data (Glaser & Strauss, 1967; Holton, 2008; Lomberg & Kirkevold, 2003). In other words, relevance is achieved by allowing the core category and theory to emerge while avoiding preconceived ideas and theories surrounding the phenomenon of interest. To attain relevance, we employed theoretical sampling and memoing, utilizing the constant comparative method.

Work is accomplished when the substantive theory clarifies how the phenomenon of interest is addressed. Glaser (1978) states, “Work is achieved if the study explains what happened” (p.4). Work was accomplished by listening to the narratives of participants. We asked open-ended questions to illustrate the breadth and depth of their experiences. To ensure the credibility of the theory, we employed a constant comparative approach (Glaser, 1978). Based on the findings, we then formed recommendations to address the issues surrounding women’s risk perception of CAD after GDM. The recommendations for this theoretical construct were outlined in the discussion.

Finally, modifiability arises when researchers adapt to participants' variations by considering different ideas and perspectives (Glaser, 1978; Glaser & Strauss, 1967). This involves recognizing the constantly changing relevance and diversity of factors influencing the phenomenon (Lomberg & Kirkevold, 2003). We maintained theoretical sensitivity and embraced new ideas and varied responses from participants, utilizing open-ended questions to encourage this (Glaser, 1978). We also acknowledge that understanding is dynamic; insights may differ among women with GDM based on their unique experiences and future encounters. In alignment with this approach, we used pragmatism and symbolic interactionism as our interpretive lens to capture participants' subjective realities.

There were also some study limitations to be cognizant of. The data obtained for this study were based on a single sample of NL women who had had GDM. Only one of the participants went on to develop CAD after having had GDM. Furthermore, although multiple attempts were made to enhance recruitment, the majority of participants in the study were from urban rather than rural areas. Therefore, the findings may not be generalizable to rural NL or other regions of Canada and the Western world. More research is warranted on populations who have experienced being diagnosed with GDM and are at risk for or have developed CAD.

Conclusions

This study provides insight into the point in the trajectory when women who had had GDM became aware of their risk for CAD and started to assimilate it. This insight was achieved through interweaving two categories: Becoming Aware of One's Risk for CAD Following GDM and Struggling to Assimilate One's Risk for CAD Post-GDM. These categories collectively explicated the moment at which the women acknowledged that they were at risk for CAD and started processing what this meant for their health trajectory. Our findings demonstrate that it is essential to consider and monitor the psychological safety of research participants from recruitment through the entire research process. Additionally, we recommend that research participants play an active role in research that involves their own health and future healthcare practices. Finally, since HCPs are considered experts in the field by their patients, HCPs must be educated and prepared to translate knowledge on the risk of CAD to this cohort and to provide support, as women who had GDM were not aware of their risk for CAD and asked for HCPs support in the interviews.

Disclosures

The authors declare that there are no potential conflicts of interest associated with this study.

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Chapter 4: Living With One's Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

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Abstract

Background: Gestational diabetes mellitus (GDM) is becoming increasingly acknowledged as a non-traditional risk factor for coronary artery disease (CAD) in women. The purpose of this grounded theory study (GT) was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being.

Methods: This study employed a GT approach, involving semi-structured interviews with women with a history of GDM and living in Newfoundland and Labrador (NL). The constant comparative method was used to facilitate data collection and analysis.

Results: The substantive theory that emerged from the study findings was *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. Twenty-six participants from NL who had GDM in the past took part in the study. This paper presents the findings supporting the third theoretical construct, *Living With the Risk for CAD Following a Diagnosis of GDM*. Two categories, (1) Barriers to Mitigating One's Risk for CAD Following GDM (2) Reducing One's Risk for CAD Following GDM, explain the barriers that prevent women from making behavioral changes to lower their risk for CAD and outline the motivators and strategies that exist to reduce this risk after GDM respectively.

Conclusions: The paper presents recommendations for overcoming barriers that hinder women from making lifestyle modifications to reduce one's risk for CAD post GDM. Motivators and strategies aimed at confronting gendered social norms and facilitating the implementation of healthy lifestyle behaviours are examined. This encompasses the formulation of interdisciplinary clinical practice guidelines to address the needs of this cohort. The paper also emphasizes the importance of integrating education on risk communication and non-traditional pregnancy-related risk factors into the training curriculum for future healthcare professionals. The study's findings further highlight the need for increased nurse-led women's health centers that incorporate sex-specific cardiac rehabilitation.

Key words: coronary artery disease, non-traditional risk factor, women, gestational diabetes mellitus, cardiovascular risk

Living With One's Risk for Coronary Artery Disease Following a Diagnosis of Gestational Diabetes Mellitus

Coronary artery disease (CAD) is the most prevalent cardiovascular condition, impacting 126 million people globally (Garcia et al., 2016; Heart and Stroke Foundation of Canada, 2024; Shahjehan & Bhutta, 2023; Stark et al., 2024). In Canada, the number of individuals living with CAD has increased from 1.5 million in 2001 to 2.4 million in 2018 (Public Health Agency of Canada, 2024; Public Health Agency of Canada, 2018). The expected prevalence rate is also projected to rise by 0.19% by 2030 (Khan et al., 2020). The province of Newfoundland and Labrador (NL) has a high prevalence rate of CAD at 8% compared to other Western and Northern Canadian provinces, with the occurrence of myocardial infarctions (MI) exceeding the national average (2.6% in NL versus. 2.0% in Canada) (Health Accord NL, 2022; Public Health Agency of Canada, 2018). Adding to the issue of high prevalence rates, CAD is also the leading cause of death globally and the second leading cause of death in Canada (Jaffer et al., 2021; Public Health Agency of Canada, 2022; Shahjehan et al., 2024). NL also has higher mortality rates from CAD than other Canadian provinces (Health Accord NL, 2022; Public Health Agency of Canada, 2018). The high prevalence and mortality rates make CAD mitigation a priority for provincial, Canadian, and global health.

CAD is also on the rise and is the leading cause of death globally for women (Lopez et al., 2019). In Canada, CAD is the leading cause of premature death for women (Izadnegahdar et al. 2014, Jaffer et al., 2021; Lopez et al., 2019; Mehta et al., 2016). In fact, a woman dies of CAD every 16 minutes in the country (Heart and Stroke Foundation of Canada, 2023; Norris & Mulvagh, 2024). Over the past ten years, Canada has also experienced increased CAD diagnoses and hospitalizations among women under the age of 55 (Arora et al., 2019; Botly et al., 2020; Jaffer et al., 2021; Norris et al., 2020). Research indicates that women face worse health outcomes related to CAD compared to men. This includes increased post-MI mortality rates, extended recovery periods, and significant psychosocial challenges, such as depression, stress, anxiety, fear, sleep issues, and difficulties in relationships (Alyasin et al., 2021; Arora et al., 2019; Botly et al., 2020; Colella et al., 2021; Garcia et al., 2016; Jaffer et al., 2021; Mattina et al., 2019; Norris et al., 2020).

Alarmingly, many women may not recognize the adverse health effects of CAD and frequently underestimate their own risk of developing this condition (Bairey Merz et al., 2017; Berry et al., 2016; Foxwell et al., 2013; McDonnell et al., 2014, 2018). Additionally, a significant number of women are unaware of common CAD symptoms (Andraweera et al., 2022; Bairey Merz et al., 2017; Beussink-Nelson et al., 2022; Colella et al., 2021; Gooding et al., 2021; Jaffer et al., 2021; Mulvagh et al., 2024; Nielsen et al., 2022; Norris et al., 2024). These gaps in awareness partly stem from the widespread perception of CAD as a "man's disease," which has historically overshadowed women's health and well-being (Davison et al., 1991; Douglas & Wildavsky, 1982; Dake & Wildavsky, 1991). As a result, women have been underrepresented in CAD research, leading to a lack of evidence-based diagnostic and treatment strategies tailored to their needs (Davison et al., 1991; Heart and Stroke Foundation, 2018; Jaffer et al., 2021; Norris et al., 2020). Two-thirds of the clinical health research conducted on CAD has focused exclusively on men (Heart and Stroke Foundation, 2018). Although social media platforms have helped increase awareness of CAD, many posts and advertisements still reinforce the misconception that CAD primarily affects men. Ensuring accurate, gender-inclusive messaging is essential to reducing delays in diagnosis and treatment for women (Jaffer et al., 2021; Norris et al., 2020).

Another contributing factor is the inadequate knowledge regarding the unique presentation of CAD in women, as well as insufficient communication about their risk status from healthcare professionals (HCPs) (Andraweera et al., 2022; Bairey Merz et al., 2017; Berry et al., 2015; Beussink-Nelson et al., 2022; Colella et al., 2021; Gooding et al., 2021; Jaffer et al., 2021; McDonnell et al., 2019; Mulgavh et al., 2024; Nielsen et al., 2022; Norris et al., 2024). Notably, less than 50% of students in the medical sciences profession received sex and gender-specific clinical training, further perpetuating these gaps in knowledge and care (Rojek & Jenkins et al., 2016).

Moreover, studies indicate that women often do not modify their behaviours and lifestyles to reduce their risk of CAD, even when they are at high risk, or have already received a diagnosis (Bairey Merz et al., 2017; Jaffer et al., 2021; Norris et al., 2024; Pelletier et al., 2016). This lack of lifestyle adjustment is often linked to time constraints. Many women find it challenging to carve out time for meal preparation or exercise due to competing social roles and responsibilities, including family life and work obligations (Bairey Merz et al., 2017). Building on these findings, women's health and well-being are often deprioritized due to societal expectations and gendered roles in family and work life. The demands of caregiving, household responsibilities, and professional obligations frequently take precedence, causing many women to overlook or delay seeking medical care. This gendered dynamic not only hinders early detection and treatment of conditions like CAD but also reinforces systemic barriers in healthcare that fail to account for women’s unique experiences and needs (Barrett-Connor, 1997; Heart and Stroke Foundation, 2018; O’Neil, 2018; Pelletier et al., 2016). Consequently, even if they are aware of their risk, women may miss the warning signs and neglect preventive steps for CAD due to societal norms and expectations, such as balancing caregiving roles with work obligations (Pelletier et al., 2016).

Adding to the lack of perception, communication, and lifestyle modifications related to CAD risk, women face not only traditional risk factors but also non-traditional, pregnancy-related risks, such as gestational diabetes mellitus (GDM). GDM is a condition whereby a woman with no previous diagnosis of diabetes exhibits high blood glucose during pregnancy (Diabetes Canada, 2024). GDM is one of the most significant pregnancy-related risk factors contributing to the development of CAD (Chen et al., 2024; Kramer et al., 2019; Minhas et al., 2024; Norris et al., 2024). Women diagnosed with GDM face lifelong CAD risk, with a 56% higher likelihood of developing CAD and a quadrupled risk of MI compared to those without GDM (Diabetes Canada, 2021; Fu & Retnakaran, 2022; Garcia et al., 2016; Green, 2021; Kramer et al., 2019). This illustrates a clear need for targeted risk-reduction strategies to reduce long-term cardiovascular complications.

Despite various recommendations, standardized clinical practice guidelines for screening and follow-up education for this high-risk group in NL are lacking (Diabetes Canada, 2024). Research on women’s risk perceptions and health behaviours specific to CAD after GDM is scarce, with little evidence exploring how women perceive their CAD risk following a GDM diagnosis. The purpose of this grounded theory (GT) study was to gain a fuller understanding of the psychosocial process experienced by women who had

GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This paper highlights the significant barriers that hinder CAD risk reduction after GDM and explores motivators and strategies to lower CAD risk in this group. We have utilized the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist to ensure that we have reported all critical aspects of the study process in this article (Tong et al., 2007). The research question was how do women living in the province of NL diagnosed with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD?

Ethical Considerations

The Human Research and Ethics Board at Memorial University of Newfoundland in St John's, NL, granted ethical approval for the study [Application number 2022.038]. Before the research interviews, informed consent was secured from all participants.

Materials and Methods

Study Design

The study used a GT research design. GT facilitates the discovery and comprehension of the psychosocial processes or behaviour patterns when knowledge about the phenomenon is limited (Glaser & Strauss, 1967). Existing literature does not adequately address women’s perceptions of their CAD risk after experiencing GDM. By using GT, the researcher can uncover conditions that reveal the variations and diversity in participants’ experiences within their everyday lives and social contexts (Glaser & Strauss, 1967). The research team adopted a post-positivist perspective and utilized tenets of pragmatism and symbolic interactionism as an interpretive lens for the study, acknowledging that although the women in this study have an actual risk for CAD, they also have unique experiences, values, and interactions that shape their behaviours and how they come to understand their personal risk status.

Participant Selection

The team employed theoretical sampling alongside data collection and analysis. This method represents a purposeful sampling technique where participants are chosen based on their experiences pertinent to the psychosocial process being studied. As such, recruitment continued until no new conditions, properties, categories, or patterns emerged from the data (Glaser, 1978; Glaser & Strauss, 1967). In this study, the participants examined were women diagnosed with GDM who are at risk for or have developed CAD. The inclusion criteria were women who: (a) women who had a diagnosis of GDM during pregnancy, (b) were able to communicate in English, (c) were over the age of 18, (d) lived in NL, (e) were mentally competent, and (f) were able to understand the purpose of the study. The emerging findings did not prompt us to interview or investigate the experiences of any other sample.

The research team utilized various recruitment methods. Physicians, cardiologists, nurses, and nurse practitioners throughout NL informed patients about the study and its objectives using a script. If a participant expressed interest in learning more, their name was forwarded to the principal investigator (PI), DB. The PI then contacted potential participants to explain the study and answer any questions. Posters were displayed in HCPs' offices, women's health clinics, community health centers, and social media platforms like Facebook. A public service announcement (PSA) was broadcast on local NL media outlets. Participants recruited in this way reached out to the PI directly and adhered to the same outlined process.

Data Collection

Twenty-six semi-structured interviews were conducted via Webex, telephone, or in person in Newfoundland and Labrador from May 2023 to December 2023. These interviews took 30-70 minutes to complete. During the interview, demographic data was collected. Two research team members (DB and AP) conducted semi-structured interviews in locations convenient and private for participants. AP has experience and expertise in conducting GT research. The interviews were recorded and then transcribed verbatim. The researchers used NVivo (13) [2020] Lumivero for data storage, management, and analysis (Lumivero, 2023). DB compared all transcriptions with the original recordings, and after verification, the audio files were immediately deleted. The transcripts were kept on a password-secured computer accessible only to the PI and AP.

Data Analysis

In GT, data collection happens simultaneously with analysis, reflecting an inductive approach (Glaser & Strauss, 1967). By merging data collection and analysis researchers gain a richer understanding of participants' experiences (Glaser & Strauss, 1967). The constant comparative method was employed, which involved continuously comparing data from each interview with data from all other interviews and within the same interview (Glaser & Strauss, 1967). This cyclical process supports theoretical sampling, where participants are selected based on the theoretical requirements of the study (Glaser & Strauss, 1967).

In addition to the constant comparative method, we used substantive and theoretical coding, memoing, and diagramming (Glaser, 1978; Glaser & Strauss, 1967). Independent data analysis began right after the interview by AP and DB. Another research team member, KJ, independently coded each interview before collaborating to review the findings and finalize the codes. The process starts with substantive coding, which involves open and selective coding. Open coding entails line-by-line analysis of data to assign preliminary codes or conceptual labels. The codes were then collapsed into properties. These properties encompass conditions which reflect the data's diversity. The properties are subsequently integrated and condensed to form conceptual categories (Glaser & Strauss, 1967). Throughout this process, the core category or the central overarching concept of the study emerges (Glaser, 1978). During selective coding, the researcher focuses on coding the core category to saturate the properties and conceptual categories (Glaser & Strauss, 1967). In this investigation, the core category identified was “perceiving risk.” Upon establishing this core category, we began theoretical coding, synthesizing the conceptual categories into theoretical constructs. The core category “perceiving risk” is embedded and reflective in these constructs. This process yielded three theoretical constructs that elucidate the psychosocial process, contributing to the substantive theory *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM*. The core category is embedded and reflective in these constructs. An overview of the study findings with the three theoretical constructs and categories relevant to the third theoretical construct, is presented in Figure 4.1. This paper discusses the findings related to the third theoretical construct.

Figure 4.1

Study Findings

Participant Demographics

The study sample comprised 26 women who had experienced GDM. Twenty of these women lived in urban NL, while six resided in rural NL. Table 4.1 presents the demographic details of these participants.

Table 4.1

Participant Demographics

Table 1: Participant Demographics	N
Age	
18-25	2
26-35	8
36-45	11
46-55	5
Date of Birth of Child/Children	
Last five years	7
Last ten years	10
Over Ten years	9
Education	
In high school	0
Completed high school	26
Post-secondary school	12
Location e.g., community	
Eastern Health	20
Central Health	3
Western Health	1
Labrador-Grenfell	2

Study Results

The findings supporting the third theoretical construct, *Living With the Risk for CAD Following a Diagnosis of GDM,* are presented in this paper. Two categories, (1) Barriers to Mitigating One's Risk for CAD Following GDM (2) Reducing One's Risk for CAD Following GDM, explain the barriers that prevent women from making behavioural changes to lower their risk for CAD and outline the motivators and strategies that exist to reduce this risk following GDM, respectively.

Barriers to Mitigating One's Risk for CAD Following GDM

The participants indicated that once they recognized that they were at risk for CAD, they began to identify barriers to implementing behavioural and lifestyle changes to reduce that risk. These included: 1) personal barriers, 2) financial barriers, and 3) the fragmentation of care. Personal barriers involved difficulties in operationalizing the behaviour change, as well as family responsibilities and work, which impeded the capacity to adopt healthier behaviours and lifestyle changes. Financial barriers included the high cost of food and limited access to medical care. Barriers to fragmented care included the absence of holistic care, dismissed care, and inconsistency among HCPs.

Although the women acknowledged the personal barriers to mitigating their risk, they reported challenges in operationalizing the behaviour change. For instance, women perceived that their busy schedules, resulting in a lack of time, prohibited them from making behavioural changes, *"For me, there is never a good time [to make changes]. I am too busy. Every time I mark the date to change, it does not work."* This sense of never having enough time led the women to feel stressed. Hence, they engaged in what they considered unhealthy but necessary coping strategies, *"I have tried to quit smoking. I certainly do not smoke as much as I used to, but my busy life is stressful and causes me to smoke."*

Another barrier identified by participants was their responsibilities to their families, including caregiving and addressing their family's needs. These responsibilities took priority over their own health, as exemplified in this narrative, *"I have three children, and this leaves very little time for myself."* "*The last couple of years with teenagers has not been easy for me."* New mothers expressed similar sentiments, *"I am* *not there yet to prioritize my health post-baby, but I would like to say I would take my health more seriously."* This perceived moral obligation to ensure that the family was taken care of first often meant that their health was on the back burner, often for decades, *"I mean, throughout pregnancy, your is to keep your baby healthy and alive. So, I will probably not think about it [my health] for maybe 10-15 years later in life."*

An additional personal barrier that limited women's capacity to embrace healthier behaviours and lifestyle changes (e.g., nutritious diet and exercise) was their work life. This was particularly true for shift workers, *"I am a shift worker. I am not eating breakfast, snacks, lunch, or supper. So, I find it challenging to regulate an eating schedule."* Participants in sedentary jobs with minimal opportunities for physical activity expressed comparable feelings, *"I change my diet, and it only lasts so long. Then, I go back to my old ways and habits. I am working a job where I am sitting a day long."* Similar sentiments were noted in the narratives of women who were employed full-time: "*I might try getting more exercise, but it is difficult to do with my lifestyle. I work full-time. It leaves very little time for me."* The participants spoke of the additional stress of job expectations as limiting their ability to engage in a healthy lifestyle, *"My job is stressful. I have many demands and stuff like that."*

Additionally, participants identified financial barriers, including the cost of living, as a primary factor hindering their ability to adopt a healthy lifestyle.:

> "*People only have so much money to spend around, and if you have other children, it is hard to stretch a dollar. If you do not have a spouse to support you or your family or whatever, it is a big issue to be able to make good choices and afford them."*

Many women specifically referred to the high cost of food as a financial barrier, *"Things I would buy every week like eggs, milk, the basics, was $68. I cannot buy the same stuff for under $100."* For some, purchasing healthy food was not an option, given its high cost and their limited income. As a result, many chose the less nutritious, yet cheaper, items that would last the longest. This, however, was noted to be more of a concern for those living in rural regions of the province where fresh foods and vegetables were often more expensive because of lack of availability, "*Fruits, vegetables, good cuts of meat, lean meat is all so expensive, and the junk food is cheap. A 2 litre of pop is cheaper than a 2 litre of milk."*

Participants frequently discussed the financial burden of accessing medical care to manage their health. This barrier was formidable for those living in rural NL who had to absorb the travelling cost to see an HCP, *"I am an hour and a half out [of the city] in a little town, so there are not many resources out here.* This financial burden included the cost of gas, accommodations, and meals associated with having to travel, "*The cost to follow up with a heart specialist right now involves a 2.5-hour drive. With fuel prices and the high cost of staying in the city, it is difficult to manage the commute financially."* Another participant highlighted similar concerns, *"The price of gas and food to travel to St. John's for appointments adds up, and many would not be able to do it financially."*

The final barrier identified by participants was fragmented care. Women said they did not receive holistic and consistent care from their HCPs. Contributing to these feelings was the perception that the HCP was too busy to engage in meaningful conversations about their health. This was noted as being essential to building a trusting relationship, "*It was difficult to communicate and build a rapport and have time to* *discuss stuff [my health] with them [HCPs]."* The women expected that their HCP would take the time to listen to their health concerns using a contextual and holistic lens; however, they were surprised when this opportunity was unavailable. Many HCPs were viewed as taking a biomedical approach to their health, focusing only on one immediate issue: "*You are there [with the HCP] to talk about one thing and one thing only. There is no room to look at the whole picture."* The fragmented care that women received was also linked to gender in how women's concerns were dismissed, *"My perception is that the HCPs that I am interacting with it's (CAD) is dismissed like it's (the risk) is gone. They (HCPs) say that was 30 years ago."* This was concerning given that many women wanted more education and ongoing communication with their HCP to understand their risk, *"I would like to have more communication [with the HCP] for sure. I felt like once I did not have GDM, there was not a whole lot of information."* There was a general sense that if they did not advocate for themselves, they would not receive the medical information that they felt they needed to make health decisions and plan for their future, "*I feel that unless I bring an issue up to my HCP, it does not get mentioned."*

The women also described the inconsistency in HCPs, including education and follow-up, as a contributing factor to the fragmentation of care,

> *You got residents coming through, and you have got locums coming through. There were so many people who were part of my experience." "Having the same follow-up and a relationship with your HCP is important. If you have 15 different people, you will not get anywhere like that."*

For one woman, this was associated with increased demands on the healthcare system: *"Sometimes it is just in and out, or you get an intern, and you get a different intern every single time…. I am sure HCPs are overrun and stressed with so many patients to see.*

Reducing One's Risk for CAD Following GDM

In response to the barriers, the women identified motivators and strategies to lower their risk for CAD. For most participants, the awareness of their CAD risk following GDM led them to reevaluate their risk status and motivated them to adopt healthier lifestyle behaviours, "*I think my biggest concern is that I did not even know about it. Now that I know, I want to manage my health."* Similar views were noted by another participant, *"When I found out that I was at risk for CAD, it made me stop and think about what I should be doing at this point in my life for my health."*

Participants also spoke of their familial responsibility as a key motivator for engaging in healthy behaviours. For most, this was articulated as wanting to watch and provide support for their children and grandchildren as they matured, *"I am worried about my son. I do not want to have a heart attack and pass away in a year or two. Maybe he would not lose his mom if I started fixing things now."* The perceived impact on the family of not engaging in healthy lifestyle choices is captured in the following response, *"I must get the weight off. If not, I am not going to be here for my grandchildren. So that worry is there for me."* Despite becoming aware of the link between the risk for CAD following GDM, for some women, this meant that their family was now at risk for CAD. As such, their concern shifted to include others. Therefore, for most, engaging in healthy lifestyle behaviours was equated with being a role model for their children, striving to fashion a healthy lifestyle and reducing their risk for CAD,*"I want to set a good example* *for our boys, being proactive and caring for ourselves. If heart disease is in our family, this is my opportunity to start eating healthier and incorporate this into our routine."*

Once women knew that they were at risk for CAD, the women spoke about consistent screening and follow-up care as a key strategy to mitigate their risk for their future,*"It concerns me that I might have something undetected. It can be silent. So, if I am at risk, I should have it checked."* However, there was diversity in opinions of when this follow-up should begin. For example, some felt that CAD screening and education should be provided upon receiving a diagnosis of GDM, so that they could initiate risk reduction strategies, *"There might be things that you can do at the beginning of your pregnancy that may decrease this [CAD development], like weight loss or watching your diet."* However, many women believed that follow-up should occur in the postpartum period, *"I think it [follow-up] should occur after you have your baby.* Others believed that immediate surveillance for CAD was unnecessary, *"I guess we should get a follow-up within a year but maybe later in the year postpartum. It is not as immediate as in the first 3 months because that time is so crazy."* Some women felt that annual follow-up was sufficient, *"I think there should be a yearly check-up. Maybe once a year, bringing up heart health,"* while others suggested longer timeframes, *"I think it would be a good idea to get checked every so many years, like every 5 years, do a follow-up with a patient."*

Despite the variation in opinions about when screening and follow-up for CAD should occur, all women agreed that it needed to be consistent, *"There needs to be some proper follow-up care by an HCP. 'Oh, you had GDM. That means you are at risk for x, y, and z.' See your levels for different things [e.g,, cholesterol levels]*." For some, this meant they had to play a more significant role in monitoring their health than expected.

For example, some reported that they had started to do self-surveillance for the signs and symptoms of CAD*, "I am more conscious of any discomfort that I feel."* For others, overseeing their healthcare trajectory meant advocating for themselves versus relying on others, *"An HCP will never check this unless it is requested. No one is checking my cholesterol."* One solution offered by a participant to address the above concerns was strict monitoring guidelines for women who have GDM, *"Maybe there should be a guideline to follow at a certain age to check for certain things [check for CAD]. Otherwise, I would not even know what to ask my HCP [about CAD screening]."* Having a cohesive interdisciplinary team oversee the operationalization of their care was considered essential for implementing a patient-centred approach and reducing fragmentation of care,

> *I think it is important to have all hands-on deck to be part of your care. I think everyone [HCPs] should know about GDM as a risk for CAD and share it with us." "Regional centers should be set up with teams, probably nurses and nutritionists. I am thinking off the top of my head.*

Although women spoke of the need for standardized guidelines to monitor their care, they felt they needed to consider the unique circumstances of their daily lives and the barriers to engaging in healthy lifestyle practices, as captured in the following narrative, *"I think the education and follow-up should depend on the person. It should be more tailored to individual's needs."*

Participants recognized access to education as a crucial strategy for reducing their risk of CAD. The use of diverse methods was suggested to remove any barriers to education about their risk, such as geographic, time-related or HCP-shortage-related challenges to education, *"I think it [education and follow-up] should be out on all platforms [in-person, virtual, online, written materials, etc.]. If it is on all platforms, it is more likely to get out there, and people are more likely to do things they need to do to reduce their risk."* Participants stated that using assorted modes of knowledge dissemination was imperative for reinforcing information about CAD and reducing the risk of developing it, *"Sometimes you do not remember everything they tell you, so if there were some information printed, that would be helpful too."* All participants said that any materials should clearly state and explain the connection between GDM and CAD, and provide guidance on how to mitigate future risk,

> *"We need …access to information. You could say research it online, but [the risk for CAD post-GDM] is something you should be told. You developed GDM, so here is what you need to do after the fact because I was just under the assumption that it has gone away. So, you must inform patients diagnosed with GDM to ensure they follow through and follow up on everything."*

Discussion

The findings from this study show that women diagnosed with GDM experienced barriers to mitigating their risk for CAD. Despite this, participants identified motivators and described strategies to increase their engagement in healthy lifestyles and behaviours. Suggestions for overcoming these barriers and leveraging motivators and strategies to start risk mitigation efforts are presented to improve education, screening, and clinical care for this group/population.

Study participants spoke of personal barriers that precipitated the fragmentation of their care. The women struggled to maintain a healthy work-life balance to operationalize recommended strategies (e.g., exercise and healthy diet) to reduce their risk of CAD. Like other research, we found that women tended to overlook their own CAD symptoms and preventive measures due to gender roles, including the expectation of balancing multiple responsibilities of the family (Barrett-Connor, 1997 Heart and Stroke Foundation, 2018; O'Neil, 2018; Pelletier et al., 2016). Participants took on the role of the primary caregiver and prioritized the health of others over their own. Evidence suggests that these factors create significant barriers to seeking medical attention and maintaining an active, healthy lifestyle (Heart and Stroke Foundation, 2018; Jaffer et al., 2021). Noteworthy is the fact that in this study, efforts to sustain prescribed healthy behaviours were noted to be additional stressors. In such cases, the women engaged in adverse behaviours to reduce their stress, such as smoking.

Strategies to address gendered social norms and facilitate the operationalization of healthy lifestyle behaviours to reduce women's risk for CAD include the development of clinical practice guidelines for screening and routine follow-up (Guerra et al., 2024; Gulati, 2023; Mosca et al., 2011; Norris et al., 2020). This is particularly significant because the guidelines set by the Canadian Cardiovascular Society do not provide essential information on monitoring sex-specific recommendations for preventing, diagnosing, and treating CAD in women (DeFilippis et al., 2021; Guerra et al., 2024; Norris et al., 2024; Parry et al., 2022). This is concerning as women lack guideline-based cardiovascular care, such as statins for preventing primary and secondary CAD, compared to men (Norris et al., 2024; Wenger et al., 2022). Adding to this, results from a meta-analysis by Collela et al. (2025) found that women are 32% less likely (OR 0.68, 95% CI: 0.62-0.74) to be referred to cardiac rehab compared to men.

These clinical practice guidelines must clearly delineate a pathway for sex-specific care and be developed by interdisciplinary team members. These guidelines need to include management of the unique risk factors (e.g., GDM, preeclampsia, etc.) that increase women’s risk for CAD and the barriers that prevent women from engaging in risk mitigation strategies (e.g., healthy eating, exercise, etc.) (Garcia et al., 2016; Gulati, 2023; Mosca et al., 2011; Mulvagh et al., 2024; Norris et al., 2020; Norris et al., 2024). Guidelines must also recommend that all women diagnosed with GDM receive a similar care pathway, regardless of geography or access to resources. They must also integrate the concerns of women at risk for developing CAD to reduce fragmentation in their care. For example, any proposed guidelines must identify consistent screening, surveillance, lifestyle interventions, and follow-up (Norris et al., 2020; Norris et al., 2024; Saeed et al., 2017).

Additionally, women must receive ongoing education about their risk for CAD and preventive strategies upon diagnosis of GDM. We found that even when women were aware of their CAD risk following GDM, they incorrectly assumed that their family members were also at risk for CAD, despite it being a pregnancy-related risk factor that specifically contributed to their own risk. Instead, they started planning role-modelling actions (e.g., engaging in fitness and healthy eating) to get their families involved in risk mitigation. This indicates that women with non-traditional risk factors for CAD after GDM do not accurately understand their risk and its implications for the health of others and underscores the importance of proper education and effective risk mitigation strategies for women. To ensure that all women are receiving the appropriate education, it is critical that HCPs have mandatory education related to the management of GDM and coinciding health risks in their undergraduate curricula (Adreak et al., 2024; Anderson et al., 2021; Norris et al., 2024; Thande et al., 2019). Unfortunately, such programming is limited in Canada and needed in medicine, nursing, and other health-related entry-to-practice curricula (Adreak et al., 2021; Adreak et al., 2024). However, the Canadian Women's Heart Health Alliance is working to address this need by raising awareness about the importance of incorporating sex-specific components into accredited curricula across the country (Adreak et al., 2021; Adreak et al., 2024; Norris et al., 2020). The curriculum for upcoming HCPs must include the necessary information on sex and gender cardiovascular health with evaluation components and how to communicate CAD risk to patients (Adreak et al., 2023; Parvand et al., 2023).

In alignment with education, communication of the risk for CAD to women is crucial, as the women in our study stated that failure to engage them in meaningful conversations about their risk for CAD and preventive strategies contributed to the fragmentation of their care. Women perceived that HCPs did not have the time to fully discuss their concerns, and often, discussions were limited to one health concern. Other studies have also shown that women at risk for developing CAD feel their health concerns are dismissed (Jenkinson et al., 2025; Johnson et al., 2021). HCPs must be prepared to support women as they try to operationalize the suggested CAD preventive strategies (Adreak et al., 2021; Adreak et al., 2023). Furthermore, knowing that one's risk perception and coinciding preventive strategies are not solely based on objective knowledge but are also shaped by personal experiences and interactions (Ferrer et al., 2015; Krimsky & Golding, 1992; Lupton, 1999; Manuel, 2015), it is critical that HCPs take a patient-centered approach to their care, and ensure that women are given the time to discuss their health. Nursing is a relational practice, well positioned to lead in navigating this cohort's healthcare trajectory (Freeley et al., 2022; Hayman et al., 2015). We recommend that nurses use health literacy strategies to educate women from the moment they are diagnosed with GDM about the importance of prioritizing their health needs and engaging in strategies to reduce their CAD risk. These tools include pamphlets, videos, online information pages, and both in-person and virtual information sessions.

Building on the previous recommendations, women’s limited ability to implement healthy behaviours highlights the need for more interdisciplinary women’s heart health centers. Currently, these centers are unavailable in NL; however, they have proven beneficial in enhancing risk mitigation strategies for CAD in women, offering specialized testing and treatment for women with CAD (Lundberg et al., 2018; Parvand et al., 2023). An interdisciplinary approach can facilitate shared decision-making among all team members and patients. Providing an integrated, comprehensive plan to improve health outcomes can enhance communication and access to holistic assessments and treatment plans (Batchelor et al., 2023; Jennings et al., 2017; Lee et al., 2023; Sokos et al., 2023). Nurse navigator roles have been found to be effective when combined with interdisciplinary team members in improving early detection and preventing CAD. Nurse navigators can lead these interdisciplinary centers by coordinating patient education and care among the disciplines and advocating for patients’ needs (Bryne et al., 2020; McMurray et al., 2017). Nurses can also play additional roles in risk reduction and screening for CAD through promoting risk-reduction strategies such as nutrition, physical activity, and smoking cessation (Bruneau et al., 2024; Buigues et al., 2022; Hayman et al., 2015; Mattiolo & Gallina, 2023; Qiu, 2024; Su & Yu, 2021).

A key component of the women-specific cardiac health centers would be sex-specific cardiac rehabilitation programs aiming to reduce fragmentation of care and improve referral rates for individuals at risk of or living with CAD (Canadian Women's Heart Health Center, 2024; Mulvagh et al., 2024). Sex-specific cardiac rehabilitation is desirable, as women and men differ in functional capacity and nutritional needs (Bouakkar et al., 2024; Smith et al., 2022). These programs help raise awareness of cardiac risk factors, improve quality of life, and lower mortality rates through offering expert advice, support, coaching, and strategies for managing cardiac risks (Bellmann et al., 2020; Canadian Women's Heart Health Center, 2024; Mulvagh et al., 2024; Craciun et al., 2023; Heindl et al., 2022). Automatic referral mechanisms should be in place to increase referral rates (Grace et al., 2021).

In conjunction with automatic referrals, a hybrid rehabilitation program that incorporates both in-centre and at-home therapy, while considering sex and gender, is recommended to ensure access for all women, regardless of their circumstances. However, to achieve this recommendation, more cardiac rehabilitation programs are urgently needed in Canada (Canadian Women's Heart Health Center, 2024; Tran et al., 2018), which currently has half as many per capita as the United States (Grace et al., 2021). While there are 170 cardiac rehabilitation programs nationwide, an estimated 200,000 additional rehabilitation spaces are necessary to manage CAD (Tran et al., 2018). Newfoundland and Labrador have 11 cardiac rehabilitation programs across the province but lack sex-specific cardiac rehabilitation centers, accentuating the need for improved services.

Financial barriers contributed to women's inability to operationalize behaviour changes that could mitigate CAD and resulted in the fragmentation of care. Financial barriers are well documented in the cardiovascular literature as factors that limit access to health care, hinder behaviour changes, delay care, and contribute to adverse clinical outcomes such as hospitalizations and higher mortality rates (Bernard et al., 2019; Campbell et al., 2017; Kris-Etherton et al., 2020; Parikh et al., 2013). We discuss two financial barriers: accessing healthcare services and the affordability of healthy food, both of which are crucial for reducing CAD risk. Access to healthcare services has been identified in the literature as a financial barrier for patients, particularly those in rural areas (Coombs et al., 2022; Douthit et al., 2015; Syed et al., 2014). This was also true for participants living in rural areas in our study. The participants described the cost of gas, accommodations, and meals associated with travelling to access healthcare services as a financial burden. We recommend enabling virtual access to specialists for individuals at risk of CAD and securing government funding for those who need to travel for in-person appointments. Additionally, nurse practitioners are available throughout the province of NL. They can assist in the primary and secondary prevention of CAD through screening and follow-up care in collaboration with other primary HCPs (Bruneau et al., 2024).

To address financial barriers related to healthy eating, government funding should be available to support nutrition initiatives, whether direct or indirect, to all patients at risk for CAD. This would ensure equitable access for women and help mitigate financial challenges in rural areas, where fresh produce is often scarce and expensive. No such initiative exists in the province (Government of NL, 2024). A healthy diet is a key aspect of “Life’s Essential 8”, the eight most crucial lifestyle factors for reducing cardiovascular risk (Bucciarelli et al., 2023; Lloyd-Jones et al., 2022; Sun et al., 2023). Poor nutrition contributes to obesity (Garcia et al., 2016), increasing the relative risk of developing CAD by 64% in women, compared to 46% in men (Flegal et al., 2012; Garcia et al., 2016). This is of relevance because women exhibit higher obesity rates than men. Eating healthily, such as choosing fruits, vegetables, and lean meats, is associated with lower CAD rates (Heart and Stroke Foundation of Canada, 2025; Micha et al., 2017; Shan et al., 2020). Given these facts, addressing financial barriers to healthy eating must be a priority for CAD prevention in women after GDM. Subsidies to lower food costs, along with resources and support for affordable, heart-healthy eating, would significantly aid in tackling this challenge. These resources should consider education on meal preparation, waste reduction, and budget-friendly shopping to support women across all income levels (Jaffer et al., 2021; Mulvagh et al., 2021; Norris et al., 2024).

Trustworthiness and Limitations

Researchers employing GT adhere to four criteria, fit, relevance, work, and modifiability, to establish the study's trustworthiness (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). The fit criterion is attained when the developed categories are derived from the data, not preconceived notions informed by the researcher's prior knowledge (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). It is essential for the theory to align with the phenomenon of interest and, in doing so, consider the diverse subjective experiences of the participants (Glaser & Strauss, 1967, p.238). To achieve this alignment, a post-positivist lens was employed to uphold objectivity throughout the research process while remaining receptive to the cohort's subjective reality. Upon reflection on the narratives provided by the participants, it became evident that the core category “perceiving risk" was congruent with the data and significantly influenced the psychosocial process. Theoretical sensitivity was exercised by revisiting the literature to identify crucial data elements. At the same time, precautions against bias were implemented through strategies such as theoretical memoing and diagram formation. Additionally, to ensure that we captured the participants’ experiences as it was lived, we provided interpretive summaries to the women. These methodologies were employed to ensure that the findings accurately reflected the participants' realities, rather than being reflective of the researchers’ beliefs and interpretations (Glaser, 1992; Glaser, 1978).

Relevance is met when the substantive theory emphasizes the fundamental concern embedded within participants’ narratives (Glaser & Strauss, 1967; Holton, 2008; Lomberg & Kirkevold, 2003). In other words, it involves letting the core category and substantive theory emerge naturally, without preconceived notions or theories about the phenomenon. To attain relevance, we employed theoretical sampling, memoing, and the constant comparative method.

Glaser (1978) asserts, “Work is achieved if the study explains what happened” (p.4). This was attained by attentively listening to the narratives of participants. We posed questions to depict the breadth and depth of their experiences. To ensure the trustworthiness of the theory, we focused on the conditions that highlighted the diversity and variation among participants, with the data from each participant undergoing continuous comparison with that of others (Glaser, 1978). Drawing from the findings, we subsequently formulated recommendations to tackle the issues surrounding women’s risk perception of CAD after GDM, based on their understanding, management, and experiences related to this risk. The recommendations for this theoretical construct were detailed in the discussion.

Finally, modifiability refers to the fluid nature of the theory (Glaser, 1978; Glaser & Strauss, 1967). If new patterns or themes emerge, the existing theory can be adapted to incorporate them. This ensures that the theory continues to reflect the lived reality of participants. This includes recognizing the constantly evolving relevance and variations in factors contributing to the phenomenon (Lomberg & Kirkevold, 2003). We employed theoretical sensitivity and remained receptive to new ideas and the diverse feedback from our participants, using open-ended questions (Glaser, 1978). We acknowledged that the experiences of women in this study may not be universal among all those with GDM, as they face unique experiences and future challenges. Therefore, we used symbolic interactionism and pragmatism as interpretive lenses for the study.

As like most research, this study did have some limitations. The data obtained for this study were based on a single sample of NL women who had had GDM. There was only one participant who went on to develop CAD after having had GDM. Moreover, despite multiple attempts to enhance recruitment, the majority of participants in the study were from urban rather than rural areas. Therefore, the findings may not be generalizable to rural NL or other regions of Canada and the Western world. More research is warranted on populations who have experienced being diagnosed with GDM and are at risk for or have developed CAD.

Conclusions

This study provides important insights into the barriers women face in making behavioural and lifestyle changes to mitigate CAD risk and the motivators and strategies that enable them to monitor their health while continuing with their daily lives. The paper offers suggestions for overcoming these barriers and leveraging motivators and strategies.

Strategies to address gendered social norms and facilitate the operationalization of healthy lifestyle behaviours are discussed. This includes the development of clinical practice guidelines for screening and follow-up for women with pregnancy-related non-traditional risk factors, aimed at providing essential information on monitoring sex-specific recommendations, preventing diagnoses, and treating CAD in women. These guidelines should be developed by interdisciplinary teams, integrating the concerns of women at risk and creating a pathway for consistent care for this cohort.

The paper also highlights the importance of incorporating education on pregnancy-related non-traditional risk factors, such as GDM, into the curriculum for future HCPs. This is necessary to enhance the knowledge of HCPs, enabling them to provide appropriate care and communicate risks to women. Risk communication can also be improved through health literacy strategies. The study's findings further emphasize the need for more interdisciplinary women's health centres that incorporate sex-specific cardiac rehabilitation. A nurse navigator could lead these centres and include members of interdisciplinary teams who collaborate to educate and offer strategies for CAD risk prevention in women. Lastly, financial barriers should be addressed for this cohort by providing subsidies for both healthcare travel and access to healthy foods.

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Chapter 5: Conclusion

Coronary artery disease (CAD) is a cardiovascular disease that is on the rise globally, nationally, and in the province of Newfoundland and Labrador (NL) (Garcia et al., 2016; Khan et al., 2020; Shahjehan & Bhutta, 2023; Health Accord NL, 2022). CAD is also increasing among women under the age of 55, resulting in poor health outcomes such as myocardial infarction (MI), psychosocial issues, and mortality within this population (Arora et al., 2019; Botly et al., 2020; Jaffer et al., 2021; Norris et al., 2020). Many women underestimate their risk of developing CAD, despite the high incidence and prevalence rates, as well as the potential poor health outcomes mentioned above (Berry et al., 2015; Foxwell et al., 2013; Heart & Stroke Foundation of Canada, 2024; McDonnell et al., 2014). Adding to women's perceptions that they are not at risk for CAD is the lack of sex-specific research in this area, lack of awareness of CAD symptoms among women, and health care professionals' (HCPs) inadequate knowledge of the risk of CAD in women (Andraweera et al., 2022; Bairey Merz et al., 2017; Berry et al., 2015; Beussink-Nelson et al., 2022; Colella et al., 2021; Gooding et al., 2021; Jaffer et al., 2021; McDonnell et al., 2014; Mulgavh et al., 2024; Nielsen et al., 2022; Norris et al., 2024).

The literature indicates that women face both traditional and pregnancy-related non-traditional risk factors for CAD (Garcia et al., 2016). One of these risk factors is gestational diabetes mellitus (GDM), which is increasingly prevalent and associated with a fourfold-higher risk for the development of CAD (Garcia et al., 2016). Despite the well-documented connection between the risk for CAD following GDM, limited research exists that explores GDM and CAD beyond the evidence supporting this association. Based on the current literature, it remains unclear where women acquire knowledge regarding the risk of CAD associated with GDM, if and when they receive education on this risk factor, and how they obtain this information. Furthermore, it is uncertain how women perceive the risk of CAD after GDM and what this risk signifies for them. Additionally, there is scant insight into how women specifically manage the risk for CAD, as well as whether they would consider making behavioural changes or any other modifications if they were aware of their CAD risk after GDM. Compounding the gaps in the research evidence is the absence of formalized screening and follow-up protocols for CAD in women who have had GDM. To address these deficiencies in the literature, a grounded theory study (GT) was conducted. This information is crucial for developing interventions that are specifically tailored to meet the distinct needs of this population.

The purpose of this GT study was to gain a fuller understanding of the psychosocial process experienced by women who had GDM as they assign meaning to the risk for CAD and make coinciding decisions about their future health and well-being. This includes how women awaken to the notion that they are at risk for CAD, how they understand, assign meaning to their risk, how they manage this risk, and how they live with the risk for CAD. The research question was how do women living in the province of NL diagnosed with GDM come to know, understand, assign meaning to, manage, and live with their risk for CAD?

Given the dearth of understanding of the phenomenon of interest, GT is an appropriate methodological approach. This GT study makes a significant contribution to the existing literature on pregnancy-related non-traditional risk factors for CAD after a diagnosis of GDM, as it is an understudied area. To our knowledge, this is the first study conducted on GDM as a risk factor for CAD in the province of NL.

The researchers employed a post-positivist lens, which draws upon tenets of pragmatism and symbolic interactionism. The researchers acknowledged that, although the women were at risk for CAD, the participants had undergone diverse experiences and interactions that fostered a state of unawareness regarding their risk. For data analysis, both substantive and theoretical coding were utilized (Glaser, 1978). During this process, we searched for relationships between participants' narratives or indicators, as the study's core category, or overarching concept, 'perceiving risk,' emerged (Glaser, 1978). Consequently, women's perception that they were not at risk for CAD influenced corresponding decisions about their health and well-being. The data yielded three theoretical constructs, each of which formed the substantive theory *Making the Shift from Unknowing to Knowing and Living With the Risk for CAD After Having had GDM.* These three constructs were presented in the previous dissertation chapters. Chapter 1 provided an overview of the literature on GDM and CAD in women, offered an overview of the study design and methods, and established the context for the three articles. The findings of the first theoretical construct, *Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM*, were presented in Chapter 2. The second theoretical construct, *Knowing One's Risk for CAD Following a Diagnosis of GDM*, was presented in Chapter 3. The third theoretical construct, *Living With One's Risk for CAD Following a Diagnosis of GDM*, was presented in Chapter 4. This chapter provides a synopsis of the key results and recommendations for education, practice, research, and policy. These results and recommendations are discussed below.

Key Results

A total of 26 women who had been diagnosed with GDM and resided in the province of NL participated in the study. Of these participants, 20 were from urban NL and six were from rural NL. One participant from the study had a confirmed diagnosis of CAD. Below is a brief overview of the results for each theoretical construct that emerged from the study findings.

Theoretical Construct 1: Sustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM

The first theoretical construct was S*ustaining a Sense of Unknowing About the Risk for CAD Following a Diagnosis of GDM*. Two categories, (1) Communicating Risk and 2) Drawing Conclusions About One's Risk, collectively explain how participants remained in a state of unknowing about their risk for CAD during pregnancy, and up to their six-week postpartum check-up.

Category 1 captured how women diagnosed with GDM received their diagnosis and the psychosocial responses related to it. The narratives indicated that these women were not informed of their risk for CAD, nor were they provided with any educational resources concerning the condition at this point in their health journey. The primary focus of care during this period was on managing GDM and the health of the infant, rather than on the future risk of CAD.

Category 2 delineated the women's experiences as they juxtaposed their objective and subjective perceptions of their health to comprehend their GDM diagnosis and any potential future risks for health complications. Through this evaluative process, all participants concluded that they did not perceive themselves at risk for CAD when being diagnosed with GDM and postpartum. The emphasis of the participants' risk assessments centred on their health and the infant, particularly regarding the diagnosis of GDM. During subsequent reflection, some participants acknowledged that they should have been cognizant of their susceptibility to CAD, particularly considering their family medical history and traditional risk factors associated with CAD.

Theoretical Construct 2: Knowing One's Risk for CAD Following a Diagnosis of GDM

The second theoretical construct was *Knowing One's Risk for CAD Following a Diagnosis of GDM*. Two categories, (1) Becoming Aware of One's Risk for CAD Following GDM and (2) Struggling to Assimilate One's Risk for CAD Post-GDM, depicted the moment when women recognized and became aware of their risk for CAD and began to process its implications for their health trajectory.

Category 1, Becoming Aware of One's Risk for CAD Following GDM, described the conditions under which participants recognized and comprehended their risk for CAD and their corresponding psychosocial responses. For all participants, the first awareness that they were at risk for CAD post-GDM, was upon receiving an invitation to participate in this research study. This included the one participant with a confirmed diagnosis of CAD. Subsequently, this information prompted women to conduct further inquiries to obtain additional insights and to participate in this research study for a more comprehensive understanding of their risk. Women raised concerns about their limited access to information regarding their risk during their healthcare trajectory.

Category 2 was Struggling to Assimilate One's Risk for CAD Post-GDM. This category indicated that an understanding of one's risk for CAD prompted the participants to rethink what this meant for their health. As they commenced this process, numerous women reconsidered whether they possessed objective indicators of CAD to assess and comprehend their current health status. Women began to incorporate this knowledge while considering the presence or absence of objective signs or symptoms of CAD. While some acknowledged their risk for CAD, others were not as readily persuaded that this was a matter of concern or that it necessitated any behaviour changes. For instance, women without objective indicators or traditional risk factors for CAD found it challenging to acknowledge their actual risk based on their individualized health risk assessment.

As these women wrestled with understanding their risk status, they reflected upon their historical health behaviours and questioned their role in contributing to their risk for CAD. Furthermore, they discussed potential strategies to mitigate their risk, encompassing implementing ways to foster a healthy diet and exercise routine. In summation, the perception of being at risk for CAD emerged from the participants' personal risk assessment, which considered the signs and symptoms of CAD.

Theoretical Construct 3: Living With One's Risk for CAD Following a Diagnosis of GDM

The third theoretical construct, *Living With One's Risk for CAD Following a Diagnosis of GDM*, pertained to the experience of living with the risk of CAD after a diagnosis of GDM. Two categories were delineated: (1) Barriers to Mitigating One's Risk for CAD Following GDM, and (2) Reducing One's Risk of CAD Following GDM. These categories elucidated the barriers that impeded women from implementing behaviour changes to diminish their risk of CAD and outlined the motivators and strategies available for mitigating this risk after GDM.

Category 1 consisted of barriers that hinder risk mitigation for CAD after GDM. Participants noted that after understanding their CAD risk through participation in the study, they began to recognize obstacles in making behavioural and lifestyle adjustments to lower that risk. These included: 1) personal barriers, 2) financial barriers, and 3) the fragmentation of care. Personal barriers involved difficulties operationalizing behaviour change, family responsibilities, and work that impeded the capacity to adopt healthier behaviours and lifestyle changes. Financial barriers included the high cost of food and limited access to medical care. Barriers to care included a lack of holistic care, dismissal of care, and inconsistency among HCPs.

Category 2, reducing one's risk for CAD following GDM, emphasized that women recognized the motivators and strategies to lower their risk of CAD in response to identified barriers. These included adopting healthy lifestyle behaviours, seeking regular screening and follow-up as a key strategy to reduce risk, and ensuring ongoing follow-up. Women underscored their critical role in monitoring their health through self-surveillance. They also highlighted the need for standardized guidelines to manage their care and the importance of an interdisciplinary team for support. Furthermore, women acknowledged the value of education and various methods of knowledge dissemination to ensure access to education for women in both urban and rural settings.

Strengths and Limitations

A significant strength of this study was the measures taken to maintain trustworthiness. The Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines were used to document aspects of the research team, methods, study context, findings, analysis, and discussions (Tong et al., 2007). GT researchers also use the four criteria, fit, relevance, work, and modifiability, to ensure trustworthiness in the study (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). To achieve fit, we employed a post-positivist lens to maintain objectivity throughout the research process while remaining open to the subjective diversity of the cohort. Upon reflecting on the participants' narratives, it became clear that the core category “perceiving risk” fit the data and influenced the psychosocial process. We employed theoretical sensitivity as discussed above and utilized theoretical memoing and formed diagrams. Furthermore, interpretive summaries were provided to the participants to confirm we had captured their lived experiences. We utilized these measures to ensure that the findings reflected the participants' realities and not the researchers’ beliefs and understandings (Glaser, 1992; Glaser, 1978).

Relevance was established since the substantive theory aligned with participants' experiences, as grounded in the data (Glaser & Strauss, 1967; Lomberg & Kirkevold, 2003). The core concern that came forth in the theory development was “perceiving risk,” and how women perceived their risk for CAD after a diagnosis of GDM across the trajectory. The substantive theory *Making the Shift from Unknowing to Knowing and Living with One’s Risk for CAD After Having had GDM* emerged and aligned with this core concern, as it tells the story of how women with GDM come to know, understand, assign meaning to, manage, and now live with this risk for CAD. The core category and theoretical constructs depict “perceiving risk” as the central concept, providing a clear picture of women’s risk perception and decision-making surrounding this phenomenon.

Work was accomplished by listening to the narratives of participants. We asked questions to illustrate the breadth and depth of their experiences. To ensure the credibility of the theory, we concentrated on the conditions that revealed the diversity and variation among participants, and used the constant comparative method (Glaser, 1978). Based on the findings, we then formed recommendations to address the issues surrounding women's risk perception of CAD after GDM based on how they came to know, understand, assign meaning to, manage, and live with this risk.

Modifiability describes how the theory can change or adapt during the research process (Glaser, 1978; Glaser & Strauss, 1967). If new patterns or themes emerge, the existing theory can be adapted to incorporate them. This helps ensure that the theory stays true to the actual experiences of participants. This includes recognizing the constantly evolving relevance and variations in factors contributing to the phenomenon (Lomberg & Kirkevold, 2003). We employed theoretical sensitivity and remained receptive to new ideas and the diverse feedback from our participants, using open-ended questions (Glaser, 1978). We acknowledged that women with GDM face unique experiences and future challenges, which may not be universal. Therefore, we used symbolic interactionism and pragmatism as interpretive lenses for the study.

Limitations of the study should also be noted. The data collected originated from a single sample of NL women with GDM. In this sample, there was only one woman who went on to develop CAD after having had GDM. Furthermore, despite several efforts to boost recruitment, most study participants were from urban NL rather than rural regions. Consequently, these findings may not apply to rural NL or extend to other areas in Canada and the Western world. A repeat study on Atlantic Canadian provinces or at a national level would be beneficial.

Recommendations

The findings present recommendations in four domains: patient education, practice, research, and healthcare policy. An overview of these recommendations is given below. These recommendations may apply to HCPs, including nurses who deliver direct care to women with GDM, and their future care following diagnosis. The recommendations would also apply to HCPs and government officials involved in developing policies, clinical practice guidelines, and decision-making for this cohort.

Education

Based on the study findings, a priority recommendation is to educate women and HCPs about the risk of CAD following GDM. This recommendation stems from the fact that women were unaware of their risk for CAD following GDM and, as a result, did not perceive this risk. Not only were women unaware that there is an actual risk for CAD that exists after GDM, but they also lacked awareness of the signs and symptoms of CAD. It is crucial to highlight that these women's lack of risk perception is understandable if they were not informed about it. Therefore, to ensure that all women receive appropriate education and healthcare, HCPs must educate this cohort on their risk. However, the literature shows that many HCPs remain unaware of the risk of CAD after GDM and have not received adequate education on this risk factor during their post-secondary training (Andreak et al., 2024). Therefore, HCPs should also receive education on the risk for CAD following a diagnosis of GDM.

To educate women and HCPs on the risk of CAD following GDM, the first step is to increase HCPs’ awareness of the risk of CAD to ensure that these women receive timely and appropriate education, intervention, and screening. This should be thorough education about the association of CAD and other sex- and gender-specific risk factors. Exposure to core modules and case studies for nurses, nurse practitioners, primary care professionals, and obstetricians in their post-secondary curriculum and into their future careers is an example of education strategies (Adreak et al., 2024; Norris et al., 2020).

Continuing education for this cohort on their risk of CAD is recommended, with a focus on improving risk communication. The study findings emphasized the importance of risk communication between HCPs and women with GDM regarding the risk for CAD. Therefore, it is crucial for HCPs to be educated on the significance and techniques of accurate and appropriate risk communication. Hence, HCPs must create a space wherein women can discuss their health within the context of their everyday experiences and realities. Being cognizant of women's subjective reality is key, because one's risk perception is not solely based on objective knowledge but is also shaped by personal experiences and social interactions (Ferrer et al., 2015; Krimsky & Golding, 1992; Lupton, 1999; Manuel, 2015).

In accordance with improving risk communication, HCPs must work towards forging a trusting relationship with patients to help them become more aware of their health status (Simmel, 1997), including knowledge of their actual risk as they make informed decisions. Since nursing is a relational practice (Freeley et al., 2022), nurses are in a good position to lead and navigate patient care by developing relationships with these women and using health literacy strategies to educate women of their risk for CAD, from the moment that they are diagnosed with GDM. Health literacy tools include pamphlets, videos, and both in-person and virtual information sessions. HCPs can then use this knowledge and heighten risk communication by developing and implementing risk communication tools (e.g., pamphlets, education sessions, etc.) into their practice. It is crucial to optimize as many knowledge sources as possible to help this cohort have an accurate understanding of their risk and coinciding health behaviors to mitigate their risk.

Practice

The study findings also prompt several recommendations for clinical practice. The focus of these recommendations is on the development of clinical practice guidelines to inform screening, education, and treatment for women at risk for CAD following a diagnosis of GDM. We suggest that these clinical practice guidelines be gender-specific to meet the diverse needs of women with CAD risk. The current focus for postpartum screening following GDM is primarily on type 2 diabetes. Women in NL are not screened for CAD following a diagnosis of GDM. Therefore, we recommend that clinical practice guidelines be developed for screening and follow-up for women with all pregnancy-related non-traditional risk factors. These should be aimed at providing essential information on monitoring sex-specific risks for CAD, to manage and reduce the risk for CAD. These guidelines should be developed by interdisciplinary teams with input from women with lived experience, integrating the concerns of women at risk, and creating a pathway for consistent care for this cohort. Nurses can also play a role in screening and intervening for CAD by promoting risk-reduction strategies, such as a balanced diet, regular physical activity, and smoking cessation. Nurse practitioners can also engage in the primary prevention of CAD, as they are often the first point of contact for women who utilize their primary healthcare services postpartum.

In addition to the need to develop clinical practice guidelines, the study findings further emphasize the need for more interdisciplinary women's health centers that incorporate sex-specific cardiac rehabilitation. In particular, sex-specific cardiac rehabilitation is necessary because women and men differ in their functional capacities and nutritional needs and preferences for cardiac rehabilitation format. A hybrid rehabilitation program that includes both in-center and at-home therapy, while considering sex and gender, is recommended to ensure access for all women, regardless of their circumstances. Furthermore, nursing leadership roles such as clinical nurse specialists would be essential for program development. Other nursing roles, such as patient educators and nurse navigators would be crucial to the effective leadership and operation of these centers. Working alongside interdisciplinary team members, these nurses would collaborate on education and strategies for CAD risk reduction for such women.

Research

Further research is warranted to inform the clinical practice guidelines discussed above. To our knowledge, this was the first study that explored women's experiences with GDM as a risk factor for CAD in the province of NL. Therefore, a repeat provincial and national study exploring how women come to know, understand, assign meaning to, manage, and live with the risk for CAD following GDM would be beneficial in expanding our knowledge and informing clinical practice guidelines.

Furthermore, a novel finding of this study was that no participants were aware that GDM was a risk factor for CAD; women only learned about it upon seeing the recruitment for this study. This recruitment ignited their awareness and made them eager to participate and learn more. This finding shows the significant impact that recruitment strategies can have on raising awareness and the psychosocial and behavioural responses of at-risk populations. Related to this, the psychological safety of research participants must be considered and monitored, from recruitment through the entire research process. The Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2) states that researchers must monitor safety and ensure appropriate plans are implemented if any threat to participants' safety arises (Canadian Institutes of Health Research et al., 2022). Despite this, the literature is limited in its examination of the potential impact of recruitment materials on the health and well-being of possible participants (Gyure et al., 2015). As such, further research is necessary to fill this knowledge gap.

The final research recommendation is to conduct a subsequent study of a similar nature either in Atlantic Canada or on a national scale. Despite thorough efforts to recruit a greater number of women who ultimately developed coronary artery disease (CAD) for this study, we were only able to enlist one participant. Expanding our recruitment efforts to encompass an Atlantic or national level may enhance our ability to recruit these participants.

Policy

Several barriers to engaging in behavioural and lifestyle changes that aid in mitigating CAD development have been discussed in this dissertation, many of which would require policy changes to occur. The participants noted financial barriers, including access to healthcare services, and the affordability of healthy foods, which are essential for reducing CAD risk. Revisions to public health policy to mitigate access barriers to healthcare services, as identified by participants, are required. This was especially true for those living in rural regions of NL. We recommend enabling virtual access to specialists for individuals at risk for CAD and securing government funding for those who need to travel for in-person appointments. Additionally, nurse practitioners are available throughout the province of NL and can implement primary and secondary CAD prevention measures, through screening and follow-up care.

Conclusion

From conducting this GT study, we have gained a better understanding of how women come to know, understand, assign meaning to, manage, and live with the risk for CAD following a diagnosis of GDM. Our findings indicate that women in the province of NL need increased, timely, and accurate knowledge of the risk for CAD following a diagnosis of GDM, through education from their HCPs. However, the HCPs also require sufficient education to provide appropriate education to women who have had GDM. An emphasis on how the risk for CAD following GDM is being communicated to women by HCPs will be key in the province, since none of these participants were aware of their risk. We also recommend that the province should have a dedicated women's health center that uses a sex-and-gender focus and an interdisciplinary team approach with women who have had GDM and other non-traditional and traditional risk factors for CAD. Nurses can play a leading role within this multidisciplinary team through program development and by serving as nurse navigators to lead patient care, utilizing their relational practice skills to ensure that women's subjective experiences of their healthcare journey are considered.

Moreover, specific clinical practice guidelines and screening protocols need to be developed for this cohort to help mitigate the development of CAD. Nurses can also play a role in creating these clinical practice guidelines in conjunction with other interdisciplinary team members. Lastly, nurse practitioners, in conjunction with primary care physicians, can engage in primary care prevention and screening for this cohort, as they have expertise in this area and will often be the primary care providers for these women in the postpartum period. While additional research is necessary to expand the understanding of how women come to know, understand, assign meaning to, manage, and live with their risk for CAD after GDM, these findings and recommendations provide a foundation for future research and practice in this field.

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