Knowledge about type 2 diabetes mellitus, its risk factors and the consumption of sugar sweetened beverages in diagnosed female patients in Vieux Fort, Saint Lucia

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Abstract

Type 2 diabetes mellitus (T2DM) is a lifestyle-related disease. Sugar sweetened beverages (SSBs) have a high content of sugar which makes it easy to get an energy excess even from small servings. Evidence shows that a higher intake of SSBs can increase the risk of developing T2DM. Research has also shown that the degree of diabetes knowledge and health literacy can be a crucial factor for the development of T2DM.

Type 2 diabetes mellitus is a fast-growing threat to public health in many parts of the world, including Saint Lucia (St. Lucia). The purpose was to explore the knowledge about T2DM, its risk factors and the consumption of SSBs prior and after diagnosis among women with T2DM in St. Lucia. A mixed methods approach was chosen. Data was collected through ten semi-structured interviews and self-administered questionnaires. Material was analysed through a manifest content analysis. The results showed that prior diagnosis the participants lacked knowledge and consumed SSBs daily or weekly. Reasons for consumption was good taste or to quench the thirst. After diagnosis, they had more knowledge about the disease and the complications, awareness of healthy lifestyle and they consumed none or less SSBs. Reasons for consumption was e.g. because of low blood sugar. The lack of knowledge of T2DM and the degree of health literacy may have contributed to the consumption of SSBs prior diagnosis. This indicates the importance of knowledge about T2DM and its risk factors to reduce the SSBs consumption and the risk of developing T2DM.

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Sammanfattning

Diabetes mellitus typ 2 (T2DM) är en livsstilsrelaterad sjukdom. Socker sötade drycker (SSBs) har ett högt sockerinnehåll vilket kan leda till ett energiöverskott även vid lågt intag. Det finns därför bevis som tyder på att ett högre intag av SSBs kan öka risken för att utveckla T2DM. Forskning har också visat på att graden av diabeteskunskap och hälsolitteracitet kan vara en avgörande faktor för utvecklingen av T2DM.

Typ 2 diabetes är ett snabbt växande hot mot folkhälsan i många delar av världen, inklusive Saint Lucia (St. Lucia). Syftet med denna studie är att belysa kunskapen om T2DM och dess riskfaktorer samt konsumtionen av SSBs före och efter diagnos bland kvinnor med T2DM i St. Lucia. Designen som användes var en kombination av två metoder. Data samlades in genom tio semi-strukturerade intervjuer och frågeformulär. Materialet analyserades med hjälp av en manifest kvalitativ innehållsanalys. Resultatet visade att deltagarna hade bristande kunskap och konsumerade SSBs dagligen eller veckovis före sin diagnos. Anledningar till konsumtion var god smak eller för att släcka törsten. Efter diagnosen visade deltagarna på en ökad kunskap om sjukdomen och dess komplikationer, medvetenhet om en hälsosam livsstil och de konsumerade ingen eller mindre SSBs än tidigare. Anledningar till konsumtion var på grund av t.ex. lågt blodsocker. Bristen på kunskap om T2DM samt graden av hälsolitteracitet kan ha bidragit till konsumtionen av SSBs före diagnos. Detta indikerar på vikten av kunskap om T2DM och dess riskfaktorer för att minska konsumtionen av SSBs samt minska risken för utvecklingen av T2DM.

Preface

This study has been conducted as a Minor Field Study (MFS) which is financed with a scholarship from the Swedish International Development Cooperation Agency (Sida). A MFS means traveling to a low- or middle-income country for at least eight weeks and perform a minor field study to collect data for a bachelor or master thesis, in our case a bachelor thesis. The aim of the scholarship is to enable for students to gain knowledge about the situation in a developing country and the issues with which the country struggles. We chose to apply for the scholarship out of interest in other cultures, and both of us saw it as a chance for personal growth. As both of us have an interest in how lifestyle affects health and lifestyle diseases, and type 2 diabetes mellitus is one of the fastest growing threat to public health in Saint Lucia (St. Lucia) this subject and country was the obvious choice for us.

It has been a long journey since we sat down with the application for the first time in April 2016 to the moment when we were given the go-ahead to travel to St. Lucia. After we got an approved MFS-scholarship in November 2016, we also had to get an approved ethics application from the Medical and Dental Council (MDC) in St. Lucia. This was a long and arduous process which involved hours in front of the computer and e-mailing back and forth with the council, requiring a great deal of tenacity. After almost one year of work, we finally had both an approved scholarship and an approved ethics application and was ready for take-off.

This has been a journey that has given us new experiences which have taught us a lot, both in the field and also on a personal level. It has been a long and difficult journey, but we do not regret that we took on the challenge.

The tasks have been distributed equally between the writers (see table 1.)

Table 1. The distribution of work between the writes in this thesis.

The task	Percentage perform by Hanna/Sofie
Planning the study	50/50
Ethics application	50/50
Litterateur search	50/50
Data collection	50/50
Analysis	50/50
Writing	50/50
Layout	50/50

Acknowledge

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Introduction

Type 2 diabetes mellitus (T2DM) is a lifestyle-related disease. It is a complex disease and does not only depend on one factor (American Diabetes Association, 2016a). It is among other things derived from a variety of risk factors such as an unhealthy diet and poor exercise habits. Foods and beverages such as those with high sugar and calorie content, for example sugar sweetened beverages (SSBs), candies and sugary snacks, can easily contribute to an unhealthy weight gain which can lead to overweight and obesity (Nordic Council of Ministers, 2014). These are also two risk factors that are strongly associated with the risk of developing T2DM. Products such as SSBs often have a high content of sugar which makes it easy to get an energy excess even from small servings. Research has shown that a higher intake of SSBs can increase the risk of developing T2DM (Malik, Popkin, Bray, Després, Willett & Hu, 2010). In this study, SSBs included soft drinks, fruit drinks, energy- and vitamin water drinks. The term "sugars" includes both intrinsic and extrinsic sugars (Nordic Council of Ministers, 2014). Intrinsic sugars are mainly present naturally in fruits and vegetables. Extrinsic sugars, also known as free sugars, are defined as monosaccharides and disaccharides added to foods and beverages, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.

Type 2 diabetes mellitus is one of the fastest growing threats to public health in many parts of the world (Choudhary & Chaudhary, 2015). To delay the onset of diabetes and prevent diabetes complications, a health education intervention programme for diabetic and non-diabetic are suggested to increase the knowledge of T2DM, risk factors, prevention and control among both parties. That is, knowledge about T2DM and its risk factors is indicated to be an instrument for reducing the prevalence of T2DM and reducing diabetes complications (Moodley & Rambiritch, 2007). Information can help people assess their risk of diabetes and provide them with motivation to seek proper treatment and care. This can inspire them to take responsibility of their disease during their lifetime.

According to Holden, Charles, King, McGregor, Satcher and Belton (2016) St. Lucia has one of the highest diabetes-related mortality rates in the world. Despite the well-developed healthcare system in St. Lucia, the country does not have an operational policy, strategy or action plan for either preventing or treating diabetes (World Health Organization (WHO), 2016a). Research has shown that consumption of SSBs and the degree of knowledge can be a significant factor and therefore it deserves to be examined more closely. To our knowledge there has not been any research done on these subjects in the Caribbean. The aim of this study is to provide new information regarding the knowledge about T2DM, its risk factors and the consumption of SSBs among women diagnosed with T2DM in St. Lucia. This information could be useful for health care- and public health professionals.

Purpose

The purpose of this study is to explore the knowledge about type 2 diabetes mellitus, its risk factors and the consumption of sugar sweetened beverages prior and after diagnosis among women with type 2 diabetes mellitus in St. Lucia.

Research questions

The study will be based on the following research questions:

- What knowledge did the participants have about T2DM and its risk factors prior and after their diagnosis?
- How frequently was SSBs consumed among the participants prior and after diagnosis?
- For what reasons were SSBs consumed among the participants prior and after diagnosis?

Background

An introduction to the country

St. Lucia is one of the islands comprising the Windward Islands in the Eastern Caribbean (Pan American Health Organization (PAHO), 2012). It has a land area of 620 km², which is about half the size of the Swedish island Öland, and is divided into 11 parishes. The biggest city of the island is Castries, which is the capital. Most St. Lucians are of pure or mixed African descent and in 2015 the population was 185,000 (PAHO, 2012; WHO, 2016b). The life expectancy at birth was 73 years of age for males and 78 years of age for females in 2015 (WHO, 2016b). Roman Catholicism is the most common religion on the island; approximately 70% of the population follow this religion (PAHO, 2012).

St. Lucia is a parliamentary democracy (Nilson, Retsö & Wachtmeister, 2016). The island has been both a French and British colony, and in 1979 it became independent from Great Britain. Since then the country has been a member of the Commonwealth, and therefore the British monarch is the head of state which is represented by a governor general. The official language is English, but as a legacy of the French colonial era a French Creole language, which is called French Patois, is spoken around the island (PAHO, 2012).

The education system, based on the British school pattern, is mandatory and free between 5 and 15 years of age (Anderberg, 2016a). The mandatory school is comprised of seven-year primary school and the first three-years part of secondary school. The largest share of the population attends and completes mandatory schooling, but only a few finish the final two-year part of secondary school. The level of education is therefore generally quite low.

Cultivation of bananas, which was the country's previous main source of income, has today lost its dominant position (Utrikespolitiska Institutet, 2013a). Because of the crisis in the banana industry, many farmers have been hit hard (Utrikespolitiska Institutet, 2013b). In 2011, one fifth of the islanders lived in poverty, and most of the poor lived in rural areas with poor housing. Tourism has grown and has become the country's most important industry. In recent years, the country has had favourable economic development and St. Lucia has therefore evolved to become a middle-income country (O'Brien Cherry, Serieux, Didier, Nuttal & Schuster, 2014; The World Bank Group, 2016). St. Lucia has transitioned from an agricultural economy to a service sector and tourism based economy. In 2013, the services industry accounted for 80% of the gross domestic product (GDP) and more than 55% of the country's employment (Anderberg, 2016b). At the same time, agriculture's share of GDP has dropped dramatically, from 15% in 1990 to 3% in 2011 (Utrikespolitiska Institutet, 2013a).

High unemployment, poverty and poor housing are among the main problems in St. Lucia (Anderberg, 2016c). Most of St. Lucians live in poverty, but the urban population is growing rapidly with the increase in income from tourism and the services industry (O'Brien Cherry et al., 2014).

Health and mortality in Saint Lucia

The four leading causes of death in St. Lucia are heart disease, cancer, stroke and diabetes (Holden et al., 2016). The main underlying factors to preventable diseases, death and avoidable health costs are socioeconomic, environmental, lifestyle and/or behavioural factors. Type 2 diabetes mellitus (T2DM) is one of the fastest growing threats to public health in many parts of the world, including St. Lucia (Choudhary et al., 2015; Holden, et al., 2016). One of the leading causes of death on the island is diabetes mellitus, specifically T2DM (Holden et al., 2016). According to Holden et al. (2016) St. Lucia has one of the highest diabetes-related mortality rates in the world, that accounts for 14.37% of total deaths, 79,22 per 100,000.

The top three risk factors that contributes to the burden of T2DM on the island are high body-mass index (BMI), poor diet and high fasting plasma glucose (Holden et al., 2016). St. Lucia's transition to tourism has promoted both economic and health changes throughout the population (O'Brien Cherry et al., 2014). The transition has led to a more sedentary lifestyle and dietary changes such as an increase in pre-packaged convenience foods, sugar sweetened beverages (SSBs) and less fresh fruits and vegetables.

According to WHO (2016a), the prevalence of diabetes in St. Lucia is more common among women than men (15.5% versus 13.7% of the population) and the risk of developing T2DM increases with age (International Diabetes Federation, 2015). Also, the prevalence of obesity, overweight and physical inactivity are higher among women than men, which are risk factors for T2DM (WHO, 2016a). St. Lucia invests more in the health sector than its neighbours measured in relation to the country's GDP, but the social safety net primarily benefits those who are employed (Landguiden, 2013b). Despite the well-developed healthcare system in St. Lucia, the country does not have an operational policy, strategy or action plan for either preventing or treating diabetes (WHO, 2016a). Nor is there an operational policy, strategy or action plan to reduce overweight and obesity or to increase physical activity. The health needs of St. Lucia's population are a complex issue that deserves attention from policymakers, clinicians, researchers and public health professionals (Holden et al., 2016). As mentioned above, St. Lucia has one of the highest diabetes-related mortality rates in the world. Therefore, there is a need to identify strategies which supports efforts to decrease the diabetes-related mortality rates and increased the well-being among the population.

Diabetes mellitus is a major economic burden for both individuals and society (Barceló, Aedo, Rajpathak & Robles, 2003). According to the International Diabetes Federation (2015) the cost for diabetes mellitus in 2015 per person and year in St. Lucia was 855 US dollars. The economic burden results in substantial economic loss for people with diabetes and their families, driven by health care costs and indirect costs caused by productivity loss from disability and premature death (Barceló et al., 2003, WHO, 2016b). People with diabetes mellitus have two-three times higher medical costs than those who are not affected by the disease (Barceló et al., 2003). Additionally, the presence of diabetes mellitus leads to a decrease in quality of life for those who suffer from the disease (Spasić, Veličković Radovanović, Catić Đorđević, Stefanović & Cvetković, 2014).

Type 2 diabetes mellitus and sugar sweetened beverages

Type 2 diabetes mellitus is a chronic disease for which there is currently no cure (Cheng Kueh, Morris & Ismail, 2016). It is a lifestyle-related disease, which is derived from a variety of lifestyle factors such as unhealthy diet and physical inactivity (American Diabetes

Association, 2016a). Discussion is ongoing as to whether T2DM is a collision between genes and environment (Tuomi, Santoro, Caprio, Cai, Weng & Groop, 2014). With T2DM, the insulin producing β-cells in pancreas cannot produce enough insulin to supply the body's need of the hormone (American Diabetes Association, 2016a). The body cells also become less sensitive to insulin; this is called insulin resistance. At first, the insulin producing gland, the pancreas, produces extra insulin to make up for the cells' poor usage of the insulin. However, over time the pancreas is not able to satisfy the cells with enough insulin which causes low use of energy in the cells. This leaves the body with an abnormally high blood glucose level. Symptoms of T2DM include urinating frequently, feeling very thirsty and hungry often, extreme fatigue, blurry vision and/or a tingling feeling in the hands/feet (American Diabetes Association, 2016b). In the long run, and without treatment, high blood glucose levels can damage the kidneys, heart and/or nerves in the eyes and feet (American Diabetes Association, 2016a). For some individuals, blood glucose levels can be stabilized through weight control by eating healthy and being physically active. But for some there is a need to complement diet and activity with oral medications and/or insulin.

An unhealthy lifestyle, e.g. a sedentary lifestyle combined with an intake of unhealthy food, increases the risk of becoming overweight and obese (Nordic Council of Ministers, 2014). These are two risk factors that are strongly associated with the risk of developing T2DM because both overweight and obesity contribute significantly to the development of insulin resistance. An excess calorie intake can contribute to an unhealthy weight gain. Foods and beverages such as those with high sugar and calorie content, for example SSBs, candies and sugary snacks, can easily contribute to an unhealthy weight gain, which can lead to overweight and obesity. These kinds of foods and beverages also increase the risk of T2DM. Products with a high content of sugar often have a high-energy density but a low nutrient density. This makes it easy to get an energy excess even from small servings, which may promote a positive energy balance. Sugar sweetened beverages are a typical example of this (Wang, Yu, Fang, Hu, 2015). In summary, evidence links SSBs consumption with weight gain. The relationship with weight gain is thought to be due to SSBs contributing to a high glycemic load with lower satiety properties compared with energy derived from solid foods (Murph, Thornley, de Zoysa, Stamp, Dalbeth & Merriman, 2015).

Research has also shown a strong correlation between consumption of SSBs and T2DM (Imamura, O'Connor, Ye, Mursu, Hayashino, Bhupathiraju & Forouhi, 2016). According to Malik et al. (2010) a higher intake of SSBs increases the risk of developing T2DM. Individuals who had an intake of one-two servings SSBs per day had a 26% greater risk of developing T2DM than individuals who drank none or less than one serving of SSBs per month. Additionally, according to Palmer, Boggs, Krishnan, Hu, Singer and Rosenberg (2008) the risk of develop T2DM increased with a higher intake of SSBs among African American women. Women who consumed two or more soft drinks per day had a 24% higher incidence relative to women who drank less than one soft drink per month. A similar association was observed for sweetened fruit drinks, with a 31% increase observed for two or more drinks per day relative to less than one drink per month. In both studies one serving was defined as a 12-oz (336 gram) can or bottle (Malik et al, 2010; Palmer et al, 2008).

Knowledge about type 2 diabetes mellitus

Knowledge and awareness about T2DM is an important factor for a high quality of life among diabetics (Pereira, Costa, Sousa, Jardim & Zanini, 2012). Cruz, Hernandez-Lane, Cohello and Bautista (2013) show in their study that both diabetics and non-diabetics have poor

knowledge about diabetes. Cruz et al. (2013) suggest that by implementing a health education intervention programme for diabetics and non-diabetics the knowledge of T2DM, risk factors, prevention and control could increase among both groups which could delay the onset of diabetes and prevent diabetes complications. Besides knowledge, individuals' attitudes and behaviour also play a key role in preventing and managing the risk factors for T2DM (Joshi, Mehta, Grover, Talati, Malhotra & Puricelli Perin, 2013).

Health education is one of the strategies that can help reduce the high prevalence of complications among diabetics by promoting self-control and/or self-care, putting the knowledge about the disease, risk factors and health factors into action (Pereira et al., 2012). It is suggested that an active participation from T2DM patients in the educational process can help promote the autonomy of the patients. The participation of diabetics in all the phases of planning, development and implementation of the educational activities are proposed to be the basis for preventive interventions and for health promotion. The health professional would play a role as a facilitator of learning that stimulates the potential and the ability to reinvent reality in people, achieving improvement of their health. But people with T2DM are co-responsible for their own health and their recovery is conditional on their active participation.

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (Stiles, 2011). The health literacy of patients with T2DM does not only describe their ability to read insulin storage instructions, eye and foot appointment slips or the glucose manual, but also to seek information on diet and lifestyle that is related to T2DM. Type 2 diabetes mellitus is a chronic disease that requires extensive self-care education and management (Al Sayah, Majumdar, Williams, Robertson & Johnson, 2012). Research has shown that individuals with T2DM commonly have limited health literacy (Bains & Egede, 2011). It has also been shown that a low health literacy is consistently associated with poorer diabetes knowledge (Al Sayah, et al., 2012). However, there is limited evidence supporting these conclusions.

Saint Jude Hospital

For our bachelor thesis, we had the pleasure of collecting our data at the St. Jude Hospital. The hospital was located in Augier, Vieux Fort, which is in the southern tip of St. Lucia (St. Jude Hospital, w.y. a). In 2009 the hospital was destroyed by a fire. Since then, the George Odlum Sports Stadium in Vieux Fort has transformed into a full service medical facility. The Government of St. Lucia decided that a total renovation of the hospital should be done in order to restore the capacity of the healthcare delivery system to serve the population on the southern half of the island. The renovation is still ongoing, and at the time of writing this thesis, no date has been determined when it will be ready for occupancy.

St. Jude Hospitals mission is "To provide quality healthcare within an enabling environment, through a cadre of personnel, modern technology and adhering to international accreditation standards" (St. Jude Hospital, w.y. b). Since its founding the hospital has been dedicated to cooperating with volunteers such as physicians, dentists and nurses from a variety of backgrounds around the world. These collaborations have been a key to the survival of St. Jude Hospital as an institution.

Method

Minor Field Study

When implementing a minor field study there are many aspects that needs to be considered. First and foremost, it is important to bear in mind the cultural differences that exist between Sweden and St. Lucia during the analysis of data. To develop a good relationship with the participants for the study can be challenging when the two different cultures and ethnicities meet. Due to difficulties getting in contact with participants on our own, and because of limited time, having a contact in field which among other things can serve as an intermediary between us and the participants, was an important part of the study. Carrying out a minor field study in a foreign country can involve restrictions that might not occur in your home country. Being flexible and adapting to the situation are therefore also important aspects to consider.

Design

A mixed methods approach was chosen for this study. The main method was qualitative. With a qualitative approach the intention was to explore the knowledge about T2DM and its risk factors and the consumption of SSBs prior and after diagnosis in women diagnosed with T2DM. With a quantitative approach the intention was to complement the qualitative data with participant variables characteristics such as age, occupation, family structure, level of physical activity, use of tobacco, type of T2DM treatment and BMI. That is, quantitative data was mainly used to provide with a background description of the participants. A mixed method approach can, according to Denscombe (2010), give a more complete and better picture of what is studied.

Sample

The participants in this study were women diagnosed with T2DM who were patients at the St. Jude Hospitals outpatient, in Vieux Fort, St. Lucia. Women were chosen since, according to WHO (2016a), the prevalence of diabetes in St. Lucia is higher among women than men. The inclusion criteria were women from 18 years onwards diagnosed with T2DM. Exclusion criteria were women who were unable to consent for themselves or had communication disabilities.

St. Jude Hospital was chosen because they have a diabetic clinic where suitable participants for the study could be contacted. All female patients who visited the diabetes clinic for three days were asked by the medical staff if they were willing to participate in the study. The selection of participants was thus a convenience sample (Bryman, 2016). This sample is a type of non-probability sampling which is often used in research because of limited economic and/or time resource (Denscombe, 2010). The optimal way to pick out a sample would have been to do a random sample also called probability sample (Bryman, 2016). Non-probability sampling has been criticized for its lack of representativeness and generalizability (Jupp, 2011). The approach is commonly used when the researcher must make use of available respondents. Given the short period that was available to collect data and the availability of participants who fit the inclusion criteria the non-probability sampling approach was considered appropriate.

In total 11 interviews were held, but only ten could be used for the study since one participant did not want to fill in the self-administered questionnaire. Thus, the study was based on ten interviews and self-administered questionnaires.

Data collection

The time frame for the study in St. Lucia was between the 26th of March to the 21st of May and the data collection was conducted during three days at the St. Jude Hospital in Vieux Fort. Data was collected partly through ten semi-structured interviews with women diagnosed with T2DM, and partly through a self-administered questionnaire. Three interviews were conducted using an interpreter since the participants only spoke French Patois. The participants' BMI were also collected by means of the medical staff at the diabetes clinic who provided this information after the participants' approval. Ten participants filled in the self-administered questionnaire and was interviewed on a single occasion.

A pilot study was conducted to test if the self-administered questionnaire and the interview guide would function well (Bryman, 2016). The pilot study was accomplished at the St. Jude Hospital with two patients from the diabetes clinic. After the pilot study one question was added at the beginning of the interview guide in order to give the participant an easier start. After the pilot study, the main study was performed at the St. Jude Hospital.

Interviews
The semi-structured interviews were based on an interview guide with two themes; knowledge about T2DM risk factors and consumption of SSBs (see Appendix 1). The themes for the interview guide were based on the study's purpose and research questions. The purpose of the interviews was to find out about the participants' knowledge concerning T2DM risk factors prior and after their diagnosis. The purpose was also to explore the participants estimated consumption of SSBs prior and after their diagnosis regarding quantities and frequency of SSBs, what kind of SSBs, and in what situations they drink/drank SSBs, but also the reasons behind their consumption. The interview guide was developed according to Denscombes (2010) framework for an interview, and it was tested by interviewing two diabetes patients at the St. Jude Hospital to ensure that it was well designed prior the interviews with the participants.

Once a week the hospital has a diabetic clinic. Every Wednesday patients come to the hospital for a check-up and to take tests. We had informed the medical staff about our study and they were also given an information sheet about who we were and what our study was about. When they were finished with a patient, they would ask the patient if they were willing to participate in the study. The interviews were then conducted in a separate room at the hospital with the two of us. The placement of the chairs for the interviews had been thought through; we arranged the seating positions so they did not face each other to create a more relaxed atmosphere (Denscombe, 2010).

We took turns conducting the interviews, with one of us asked questions and took field notes and the other person only took field notes. To listen and receive is a creative process (Dalen, 2015). Before and during an interview it is therefore important to reflect over one's own pre-understanding and how it could affect the interview and later interpretation. Denscombe (2010) highlights the importance of being attentive, non-judgemental and show genuine interest as an interviewer. The aim during the interviews was to keep a natural approach when asking and receiving questions, but with a curiosity so that the participant would feel comfortable but also willing to share as much information as possible.

Ten interviews were conducted and recorded using a smartphone. The interviews lasted between 10-45 minutes. Before the interview started we introduced ourselves and informed the participant about the study details and explained the assurance about their ethical rights. This was done to give the participant some idea of what to expect from the interview but also to get a relaxed atmosphere in which the participant would feel comfortable to opening up (Denscombe, 2010; Gill, Stewart, Treasure & Chadwick, 2008). The participants' consent was requested to record the interview. Field notes were also taken during the interviews by both of us.

At the beginning of every interview the participants were asked how they discovered their diabetes. To give the participant confidence and an easy start, it is advisable to start an interview with a question that is easy for the participant to answer (Denscombe, 2010). Follow-up questions were asked to obtain more detailed information if needed. At the end of the interview the participants were asked if there was anything else they wanted to share regarding their knowledge about T2DM, its risk factors or their consumption of SSBs. This gave the participants' the opportunity to raise any points that they thought still needed to be covered or had not been covered and could create further interesting data for the study. Most of the participants had nothing to add.

Self-administered questionnaires

The self-administered questionnaires contained eight closed questions and involved three different themes regarding background information, diagnosis and treatment, and lifestyle (see Appendix 2). The questions requested factual information that was not judgemental or requiring personal attitudes (Denscombe, 2010). The self-administered questionnaire asked about the participant's age, occupation, family structure, when the participant got the dignosis, use of tobacco, type of T2DM treatment and level of physical activity. According to Denscombe (2010) a questionnaire is reasonable when a study requires straightforward information that is relatively brief and uncontroversial. The purpose of the self-administered questionnaire was to collect straight and simple answers from the participants that could give us a clear picture of who the participant was and to complement the interviews.

The participants could choose for themselves if they wanted to fill in the questionnaire before or after the interview. It took about 5 minutes for the participants to fill in the questionnaire. Before the participants began to fill in the questionnaire, they received instructions on how to answer the questions. The questionnaire started with three straightforward questions and moved forward to more oped-ended questions that required the participant to think a little, e.g. when she got the diagnosis. Starting the questionnaire with easy questions is recommended to ensure a greater likelihood that the participant will keep answering the questions and persevere (Denscombe, 2010). The last two questions were closed-ended questions and contained instructions to tick one option. The participants filled in the questionnaire in the same room that the interview was held and we were present in the room in case the participants had any questions regarding any question. Ten of 11 participants filled in the self-administered questionnaire.

Analysis of data

The interviews were transcribed and analysed through a qualitative content analysis (Granskär & Höglund-Nielsen, 2012). The qualitative content analysis can be useful in the analysis of people's stories of a phenomenon or an experience and can describe the meaning of the qualitative material such as interviews (Granskär & Höglund-Nielsen, 2012; Schreier, 2012).

The method is suitable for all text that requires some degree of interpretation (Schreier, 2012). To use a qualitative content analysis, the analysis must focus on selected aspects of the material, as indicated by the study's research question. There are two approaches to perform qualitative content analysis, a latent or a manifest content analysis (Dooley, 2016). In the present study, a manifest analysis of the text was used. When using a manifest content analysis, the researcher analyses the text obvious content, which can be described in terms of categories. The methodological approach was inductive, meaning that the analysis of the transcribed material was open-ended (Granskär & Höglund-Nielsen, 2012; Schreier, 2012).

To get a complete picture of the data it was read through several times by the both of us. The analysis was divided into four parts: knowledge about T2DM and its risk factors prior diagnosis and also after diagnosis, and consumption of SSBs prior and after diagnosis. The analysis process began with the basis of the purpose and research questions, to a) identify parts of the texts that formed meaning units in relation to the purpose and research questions. These meaning units could be a few words, a sentence or a paragraph that is related by their content and context. The meaning units must not consist of multiple meanings, as the risk of losing some of the contents might occur. Nor shall the meaning units be too small as it could lose its context. b) The meaning units were condensed down to a more short and manageable text, but without losing the meaning. c) These condensed meaning units was provided with codes that describe the meaning units' statements. d) The codes differences and similarities was identified and sorted to form subcategories. These subcategories should be mutually exclusive, i.e. one code should only end up in one subcategory. e) Together the subcategories then formed 12 different categories regarding the participants' knowledge about T2DM and its risk factors, and consumption of SSBs prior and after their diagnosis. Table 2 below shows examples from the analysis process.

Table 2. Examples of the analysis process

Meaning units	Condensation	Codes	Subcategories	Categories
"She knew about diabetes generally. She knew that people have diabetes and it is because of too much sugar"	Knew about diabetes generally, it is because of too much sugar	Diabetes is caused by too much sugar	Diet as a risk factor	Importance of food
"You should not use the sugar in the juice. And… eat a lot of fruits. Not to use… not to use salt, for the blood pressure"	Not use sugar and salt, eat a lot of fruit	Eating less sugar and salt	Lifestyle changes	Knowledge to action
"Very sweet soft drinks. I didn't like the Coca Cola because it was not sweet enough. I went for the other ones that was sweeter. There one called Busta"	The Coca Cola was not sweet enough so I went for the other ones that was sweeter	Went for the sweetest	Tasty	Refreshing

Ethical considerations

To conduct data at the St. Jude Hospital, the study needed to get ethical approval from the Medical and Dental Council´s (MDC) Research Ethics Committee (REC) in St. Lucia. The REC reviewed and approved the application for the study on 17th February 2017 (see Appendix 3). This approval required that the study would be carried out within the conditions laid out for the proposal.

The participants were informed according to the four ethical principles (Vetenskapsrådet, 2002);

- *The requirement for information:* the participants were informed about the purpose of the study and that their participation was voluntary.
- *The requirement for approval:* the participants had the right to decide about their own participation which means that they had the right to drop out of the study if desired. Furthermore, we emphasized that the participation in the study was voluntary and that it would not be carried out without the participants' consent.
- *The requirement of confidentiality:* information about the participants was treated with the utmost confidentiality, e.g. the participants' real names were not used in the study. Participants names were replaced with numbers to ensure confidentiality.
- *The requirement of usage:* this requirement means that the data collected on participants were only used for the study.

A participant information sheet and consent form was distributed to the participants that they signed to indicate their participation (see Appendix 4). We also signed the consent form, and the participants got a copy of it. The data was collected through interviews and self-administered questionnaires that contained personal information and could be perceived as uncomfortable, but the study did not expose the participants to any physical or psychological risks or hazards. The participation in the study was voluntary and if any participant would feel uncomfortable they had the right to drop out of the study if desired. Their personal data would then not be used in the study.

Results

In this section the main results will be presented. The results from the self-administered questionnaires will be presented first followed by the results from the analysis of the interviews. The results of the analysis are presented in four different areas; 1) knowledge about T2DM prior diagnosis, 2) knowledge about T2DM after diagnosis, 3) consumption of SSBs prior diagnosis and 4) consumption of SSBs after diagnosis. Each area is presented with different categories and subcategories from the analysis, and is strengthened with quotes from the interviews. The interviewees are coded with numbers 1-10 in parentheses.

Self-administered questionnaire

The participants ranged in age from 55-84 years. The occupations of the participants are housewives, retired nurse, retired teacher, hospital attendant and maid. Most of the participants have children but no husband. Some of them are married and one participant have no children.

The length of time since patient diagnosis are a large interval. The minority of the participants were diagnosed between one-nine years ago, while most of the participants were diagnosed

over ten-20 years ago. The majority of the participants' treatment is medications such as metformin and insulin. Only one participant is not using medicine.

None of the participants are smoking or have smoked. The collected data on the participants' BMI is between 22-35 kilogram per square meter (kg/m²). One participant has increased and five participants have decreased the level of physical activity since diagnosis. Three participants have the same level of physical activity prior and after diagnosis. In order to be physical active 30 minutes per day it requires a total of 210 minutes per week. Three participants reached this level of physical activity prior diagnosis. After diagnosis two participants reached this level of physical activity. The participants reported level of physical activity is presented in figure 1 below.
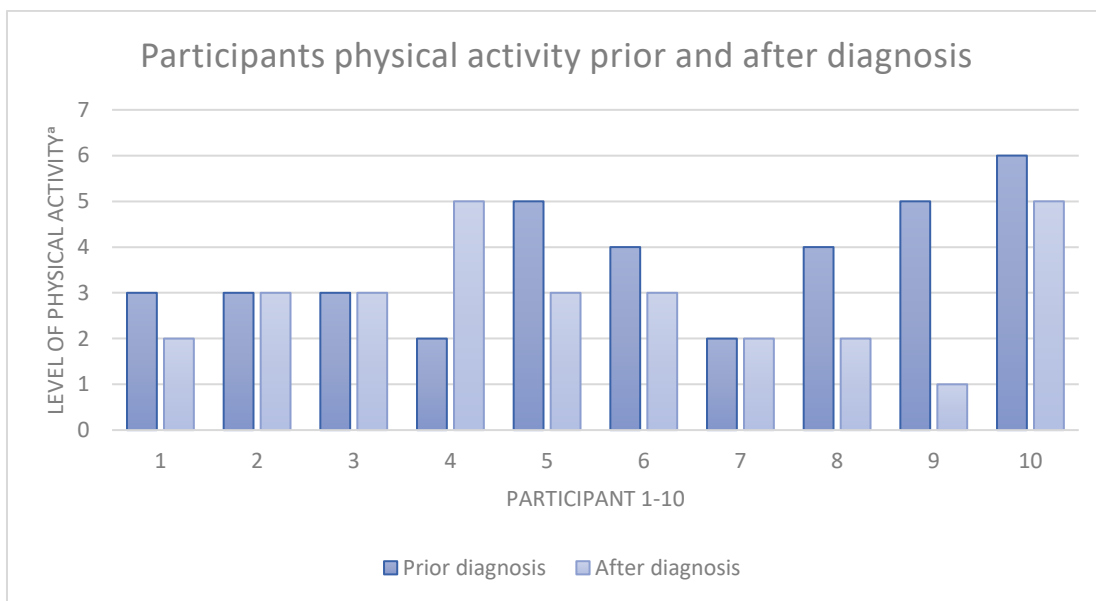
Figure 1. Distribution of participants' level of physical activity.
[a]Minutes per week is expressed as 1= Less than 30 minutes, 2= 30-60 minutes, 3= 60-90 minutes, 4=90-150 minutes, 5= 150-300 minutes, 6= more than 300 minutes.

Knowledge about type 2 diabetes mellitus prior diagnosis

The analysis regarding knowledge about T2DM prior to diagnosis resulted in four categories and six subcategories (see table 4). The categories are "poor knowledge", "importance of food", "knowledge of physiology", and "empirical knowledge."

Table 4. Categories and subcategories regarding knowledge about T2DM prior to diagnosis.

Categories	Subcategories
Poor knowledge	Deliberately unaware
	Lack of knowledge and risk factors
Importance of food	The importance of diet as a diabetic
	Diet as a risk factor
Knowledge of physiology	
Empirical knowledge	Experiential knowledge
	General understanding

Poor knowledge

The participants stated that they were deliberately unaware about T2DM and the risk factors prior their diagnosis. They meant that you must be diagnosed with the disease to gain knowledge about it and its risk factors. The category includes the subcategories "deliberately unaware" and "lack of knowledge and risk factors."

The subcategory *Deliberately unaware* shows that when the participants did not have T2DM, they never thought that they would develop the disease. Therefore, they decided there was no reason for them to get knowledge about T2DM and its risk factors. The following statement is an example of lack of motivation to learn about T2DM: "You know when you do not have it, you do not go into the background and check about it." (1) The participants felt no concern for T2DM prior their diagnosis. They were not careful prior the diagnosis because they never thought that they would reach that stage and be diagnosed with T2DM.

> And then sometimes you do not feel that you will reach that stage, and then you continue to one day they tell you that you got diabetes. So, like you not careful before. (6)

> No, when I heard something about diabetes it did not mean anything to me because I never thought I would found myself with it, you know. (5)

In the subcategory, *Lack of knowledge and risk factors*, data showed that some of the participants lacked knowledge about T2DM risk factors prior to diagnosis. They did not know what could cause T2DM. "….at that time I did not know what was good or no good for you, you know." (3) It was mentioned that it was first after the diagnosis that knowledge about T2DM and its risk factors were collected. "No, she did not know about risk factors. When she had it she found out about a few things." (1)

Importance of food

Most of the participants that had knowledge about risk factors for T2DM prior to diagnosis mentioned only the diet as a risk factor. They also state that the diet is important when you developed the disease. The category includes the following subcategories: "the importance of diet as a diabetic" and "diet as a risk factor."

As the subcategory, *The importance of diet as a diabetic,* indicated some of the participants state that they had a clue about what people should not eat when they are diabetic. Most of them said that sugar and starchy foods are not good when you have T2DM. "My grandmother used to mention that food rich in starch was bad." (3) Some of the participants mention that they had knowledge of risk factors for T2DM prior diagnosis. According to the subcategory *Diet as a risk factor* the participants knew about risk factors of the wrong diet such as too much sugar and starchy foods, and also that the portion of food you eat and what you drink have an impact. It is also mention that smoking can be a risk factor for T2DM.

> I had an idea about it. The consumption of sugar and even the carbohydrates, so both the starch and the sugar...Like the portion of food you eat, what kind of food you eat, you understand? The beverages you drink as well. (7)

Knowledge of physiology

A minority of the participants shared that prior to diagnosis they had some physiological knowledge about T2DM and the symptoms of T2DM. They mentioned that they knew that the pancreas that cannot produce enough insulin. "The body will reach a point when the pancreas cannot produce enough insulin." (9) The same patient also mention that she knew the

symptoms for T2DM, such as thirst and much urinating. It was stated by some of the participants that if ants were drawn to the urine, it was a sign of T2DM.

> Well, I listened to others who in fact suffered from the disease and one of the things I learned from them was one of the way you can detect if you have diabetes is that after you have been using the lavatory, or if you urinate in a container or something, and ants is inside of the container now that is a sign that you have diabetes. (5)

Empirical knowledge

The majority of the participants had an empirical knowledge about T2DM, that is knowledge through experience. They had a general understanding about T2DM. The category includes the subcategories; "experiential knowledge" and "general understanding." The subcategory *Experiential knowledge* shows that it is common that the participants have a family member who also have T2DM. Therefore, knowledge about T2DM came from the participants' own experience with other people in their surroundings.

> Yeah, I had my mum's experience, and my mum's sister. But I think my mum's was very more dangerous. And my aunt had it in early age and she was treated. (8)

It is mention by one participant that she thought that diabetes was caused by depression, since her mum was depression when she got her T2DM. Another participant thought prior the diagnosis that it was only older people that got T2DM. "Yes I knew, I knew it existed, yes. But I always thought diabetes was for older people you know, maybe my mother." (5) It is also mention that T2DM could be genetic. "...I think they say that it runs in the blood." (8) Most of the participants says that they knew that T2DM existed prior their diagnosis. They had a *General understanding* about it but, they did not know details about what it was or what could cause the disease. "Yes I knew it existed but I did not know what diabetes was. Sure, I had heard about it but not more than that." (2)

Knowledge about type 2 diabetes mellitus after diagnosis

The analysis regarding knowledge about T2DM after diagnosis can be divided into two categories and two subcategories (see table 5). The categories are; "knowledge into action" and "experiential knowledge of risk factors."

Table 5. Categories and subcategories regarding knowledge about T2DM after diagnosis.

Categories	Subcategories
Knowledge into action	Knowledge of the risks associated with T2DM Lifestyle changes
Experiential knowledge of risk factors	

Knowledge into action

Today the participants have knowledge about the risks of T2DM and what kind of lifestyle changes they must make regarding diet and exercise to reduce these risks. The category includes the subcategories "knowledge of the risks associated with T2DM" and "lifestyle changes." The participants are aware of the risk that T2DM can cause; this is captured in the subcategory *Knowledge of the risks associated with T2DM*. They know that there is a risk for

a foot or leg amputation. Some of the participants tell they are afraid of these risks and that they must be careful in order to not be affected.

> I have so much more knowledge, because sometimes you are scared to have an amputation, you are scared of being blind, you know the signs. You are scared of going through kidney problem, because you know, you have to be on dialysis … so, you have to be careful. (6)

A participant mention that she already has lost two toes and emphasize that it is very important to take care of the feet. Another participant point out the information she has got from the doctor regarding amputation and the importance of a strict diet.

> She says after she had it (T2DM), after they explained that to her why she was feeling dizzy and all of that. So afterwards then she knows that, they could take her leg or something. And that she has to get a very strict diet. (1)

In the subcategory *Lifestyle changes* the participants state that after diagnosis they gained knowledge of what they are supposed to eat and what they not are supposed to eat. It is knowledge that they did not have before, which has led to lifestyle changes after their diagnosis. The majority of the participants mentioned that too much sugar, salt and starchy foods are not good to eat when you are diabetic. "You should not use the sugar in the juice. And… eat a lot of fruits. Not to use… not to use salt, for the blood pressure." (9) Some of the participants also mention the importance of the amount of the food you eat and the amount of drinks you drink.

> What to eat and so on, and what not to drink. Although, they tell you that you can eat everything but just reduce the amount… (3)

> But what I have learned now when I am diabetic is that it is not just eating sweet things. Even the amount of starch that I eat, because that starch from...from the carbohydrate, will change to sugar in the body for the body to be able to use it. So, I realize now that not only must I eat less sugar, but I need to eat less starchy foods as well. (5)

Other lifestyle changes such as exercise is also mention by some of the participants.

> More knowledge about the dietary practices, it is important that you exercise. Keeping healthy, drinking water, putting off the sugars. (4)

Experiential knowledge of risk factors

Today some of the participants' knowledge of the risk factors are based on their own experiences. One participant mention that sugar and starchy foods are risk factors for T2DM because she used to consume a lot herself. Another participant note that stress is a risk factor for diabetes since she was very stressed when she got her diagnosis.

> ...But stress could be one factor. You know, I was going through a lot of stress by the time… and I think that all the stress would make my go for high blood pressure and T2DM. (5)

Medication for high blood pressure is another risk factor that was mentioned based on the participant's own experience. Also, factors such as depression and overwork are mentioned as risk factors for T2DM from a participant.

> Yes, because I have been listening over the radio sometimes and they were saying it was not the salt and not the sugar that caused it. So, they wanted to find out what is the case of so many diabetics in St. Lucia. But I figured it out myself, I think it is overwork. The body is over powered, there is too much pressure over the veins, over the vessels and so on. (8)

Consumption of sugar sweetened beverages prior diagnosis

The analysis regarding consumption of SSBs prior to diagnosis resulted in four categories and two subcategories (see table 6). The categories are "refreshing", "sugar addiction", "daily consumers" and "weekly consumers."

Table 6. Categories and subcategories regarding consumption of SSBs prior diagnosis.

Categories	Subcategories
Refreshing	Quencher Tasty
Sugar addiction	
Daily consumers	
Weekly consumers	

Refreshing
Participants who chose to drink SSBs prior to diagnosis says it was because it was refreshing. The category includes the subcategories "quencher" and "tasty."

Most of the participants drank SSBs prior to their diagnosis when they felt thirsty. In the subcategory, *Quencher,* it is mentioned by the participants that it was good to quench the thirst when it was hot outside. "Yeah, when the heat is on, it is what you want to do." (1) It is mention that SSBs were preferentially chosen to quench the thirst instead of water.

> No, it was not on the light scale. But you know it is good, sometimes when you are thirsty, instead of water you drink SSBs. (4)

Some of the participants drank SSBs because they were *Tasty*. "Sometimes I felt like drinking because of the taste." (9) One participant brings up that she thought that Coca Cola was not sweet enough so she went for something sweeter.

> Very sweet soft drinks. I did not like the Coca Cola because it was not sweet enough. I went for the other ones that was sweeter. There one called Busta. (5)

Sugar addiction
A small number of the participants' statements indicated that SSBs had an addictive effect on them. "...I like Coke a lot. Because I just loved it. I think I was addictive to it." (6) It is also stated by the participants that there was a craving for sweets things. "Oh it (consumption) was really bad. I had a crave for sweet things ... I just felt like drinking something sweet. It was not about eating sweet things, it was about drinking something sweet." (5)

Daily consumers

Some of the participants drank SSBs every day prior to their diagnosis. For most of the participants it was hard to remember the quantity of SSBs. "How much I cannot remember, it (the diagnosis) was so long time ago. But I drank it every day." (2) The participants that remembered the quantity mentions that they may have been drinking more than three bottles of SSBs every day or 1 liter of SSB. "Sometime at a day I could be drinking more than three bottle of Coke, the plastic one." (6)

Weekly consumers

The participants who were weekly consumers drank SSBs 1-3 times per week, but none of the weekly consumers remember the quantity of the SSBs. It was stated that SSBs were consumed one to three times per week.

Consumption of sugar sweetened beverages after diagnosis

The analysis regarding consumption of SSBs after diagnosis can be divided in two categories (see table 7). The categories are "no consumption" and "continued consumption due to different causes."

Table 7. Categories regarding consumption of SSBs after diagnosis.

Categories
No consumption
Continued consumption due to different causes

No consumption

Most of the participants are not drinking SSBs today due to their diabetes. Instead they choose to drink water to quench the thirst. "But now, as I am, I do not drink juice. I drink water." (3) "When I am thirsty I do not go and get a soft drink to quench my thirst, I will take water." (5)

Continued consumption due to different causes

Some of the participants still drink SSBs, but only in certain situations. Examples of these certain situations includes when they feel low or to prevent getting low blood sugar because of the insulin. Another reason that are given as to why SSBs still are consumed occasionally was because of the good taste.

> But now when I have the diabetes I do not use it. But sometimes you can take a little, when you feel low. (9)

> Sometimes I drink Malt because it is good, but it is not often. Sometimes a whole month will pass and I do not drink it because I know since with my diagnosis it is not good for me... (7)

Knowledge and consumption of sugar sweetened beverages

Figure 2 shows the timeline of the categories regarding the participants' knowledge about T2DM, its risk factors and their consumption of SSBs prior to and after the diagnosis. The figure illustrates what knowledge of T2DM and its risk factors the participants had prior and after diagnosis and how much and why they consumed SSBs. Prior to diagnosis the participants had poor knowledge about T2DM and its risk factors, but they had some

knowledge, for example the importance of food. The participants consumed SSBs daily or weekly prior to diagnosis. After diagnosis, it shows that the participants have gained an increased knowledge about T2DM, its risk factors and that they have put their knowledge into action. It also shows that they consume none or less SSBs after diagnosis.
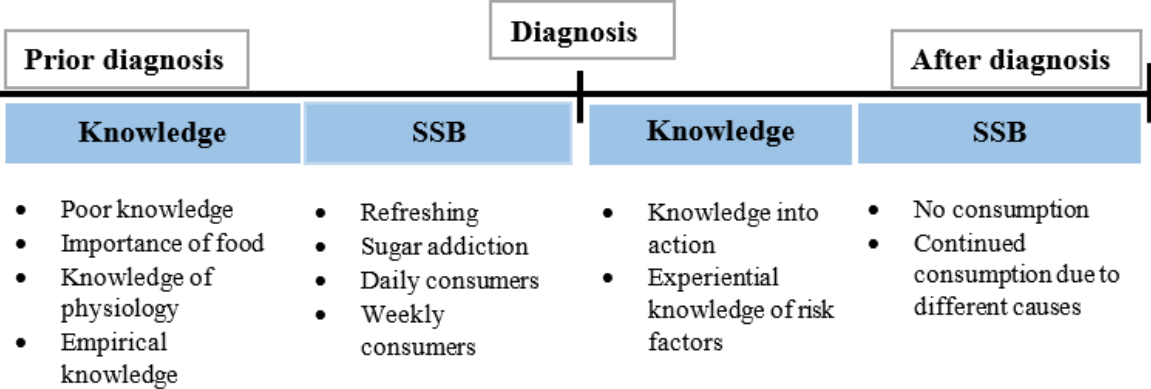

Figure 2. Timeline for the categories prior and after diagnosis

Discussion

Discussion of methods

Assessing a qualitative study: trustworthiness and authenticity

The degree to which the results of a qualitative study are trustworthy and the degree to which the results could be transferred to other groups and situations that have not been investigated depends, according to Bryman (2016), on four trustworthiness criteria. Our western perspective has affected the way we have looked at the data collected for the study. Therefore, our background and culture have surely influenced how the study has taken shape. The *credibility* of the study could therefore be questioned but, since we lived in St. Lucia for two months and got to know their culture during our stay we argue that the credibility for the study increased. The degree to which findings can be *transferred* to other contexts presents a problem for qualitative studies (Bryman, 2016). But the sample for this study was well described, and also the context in which the data was collected to provide a rich description of the culture. A thorough description of the methods used in the study offers information as to how repeatable the study could be (Bryman, 2016). The specific ways of data gathering, analysis, and interpretation of the data has therefore been described with as much detail as possible to meet the requirements regarding the *dependability* of the study. We have kept in mind the importance of *confirmability* throughout the study and have not deliberately put in our own values in the study. We have tried to stay as objective as possible throughout the study, but it is nearly impossible to be completely impartial when analysing data (Bryman, 2016).

In addition to the four trustworthiness criteria, a criterion of authenticity should be considered while assessing a qualitative study (Bryman, 2016). We hope to have given a fair picture of the different viewpoints among the study participants, and that our study can contribute to a better understanding of their social milieu since the hospital will have access to the final report.

Design

A mixed methods approach was chosen for this study, but the main method that was used was qualitative. By using this approach, it gave the result a more complete picture and description of the participants' knowledge about T2DM and its risk factors and their consumption of SSBs prior to and after diagnosis relative to their background and lifestyle (Denscombe, 2010). It is a benefit using a mixed methods approach since these various methods can be complementary to each other. The quantitative approach, with the self-administered questionnaire, was primarily used to provide an overview of the information about the participants. With the qualitative approach, the participants' knowledge and consumption of SSBs were explored relative to the quantitative data. Disadvantages of the mixed methods approach is that the results from the different methods might not corroborate one another (Denscombe, 2010). If this would be the case, the researcher may be faced with the need to extend the research to find the reason for this.

Changes in purpose and research questions

A question that was not brought up but which was answered in all the interviews was the participants' diabetes knowledge. Since we got the information from all the participants we chose to include it in the study. We considered the information to be interesting and complementary to the participants' knowledge about T2DM risk factors. This resulted in a correction of the purpose and the research questions of the study, adding knowledge about T2DM.

Interviews

Per the REC-approved ethics application, we conducted our interviews and self-administered questionnaires at St. Jude Hospital. Due to the RECs decision, we could not perform our study elsewhere. The hospital was the place where we could get in contact with participants most easily, but it can be questioned whether it was suitable or not to hold the interviews there. The participants may not be comfortable in these settings which might have influenced the quality of the interviews. But due to the time frame we had available to collect data, the hospital was the most convenient place. Since it had a diabetes clinic once a week and since the patients already were at the hospital we argue that it was suitable to conduct the interviews following their doctor's appointments. In this case, we did not need to schedule in a new time for the participants to come back to the hospital.

We cannot gauge how the women in the study felt about being interviewed by two women who were half their age. The interview is an artificial situation and for some participants it may have felt uncomfortable at first. During some of the interviews we got some short answers. A contributing factor for this could be the audio recording (Denscombe, 2010). Although the participants agreed to being recorded this could have inhibited the participant. According to Denscombe (2010), statements from the interviewee can be affected by the identity of the researcher. Additionally, interviews are based on what people say rather than what they do, and these two do not always coincide. The impact of the interviewer means that consistency and objectivity are hard to achieve which has an adverse effect on the reliability. However, this is a difficult criterion to meet in a qualitative study (Bryman, 2016). Another source of error in interviews that we discovered during the data collection is the risk that the interviewee misunderstood the question or that we perceived the answers wrong. There was also a risk for recall bias since it was a long time ago some of the participants got their diagnosis and might not remembered correctly when asked about the past (El-Masri, 2013). Since it was a big range between when the participants got their diagnosis there is a risk that their ability to recall information differ (Boslaugh, 2008). This could have affected the results and compromised its generalizability (El-Masri, 2013).

Despite the disadvantages with interviews, it is a good method for collecting data based on interviewees' opinions and ideas (Denscombe, 2010). Since we wanted to find out about the participants' knowledge about T2DM and its risk factors as well as the reason for their consumption of SSBs to prior and after diagnosis, interviews as a data collection method was a strength with the study.

Interpreter

Since some of the participants spoke French Patois, an interpreter was needed for the study. This could be a weakness in the study since the interpreter could edit the information either given by the participant or by the interviewer (Suurmond, Woudstra & Essink-Bot, 2016). Since the interpreters were daughters of the participants, there were some occasions where the interpreter took over the role of the participant. On some occasions, based on their body language, it was perceived that the interpreter and the participant could have given different answers or that the interpreter added answers that the interpreter knew. Perhaps this could be because the daughter knew something that the participant did not want us to know. This was an ethical difficulty that was hard to address since we could not know what was the participant's actual statement. This made it hard to interpret some of the answers from the interviews where we used an interpreter. To minimize bias, it would have been beneficial to use an interpreter who was not an informal interpreter (the daughters), even if their presence affected the participants' perception of a safe and pleasant atmosphere.

Problems of transcription

Some difficulties were found regarding the transcription of the audio recordings. In some of the recorded data it was hard to hear what the participants were saying due to mumbling and other disturbing sounds, this may have led to loss of important data. In this kind of situation, it was important to consider if we should use these parts of the interview and do a reasonable interpretation about what was said or if we should have excluded them (Denscombe, 2010). To reduce these errors, it could have been beneficial if the both of us had listened to all recorded data instead of splitting the recorded data between us (Bryman, 2016). Another difficulty with the transcription was that the interviews were in English and the participants had a French-based dialect with influences of West African, English and Spanish. This made it even more difficult to understand the recorded data.

Self-administered questionnaire

A self-administered questionnaire was used in the study to collect straightforward information which was relatively brief and uncontroversial (Denscombe, 2010). This gave us an opportunity to get an overview of each participant's age, occupation and family structure. It also gave an overview of the participants' diagnosis and lifestyle such as smoking and level of physical activity. When interpreting texts, it presupposes that you have knowledge about the participants' age, occupation, family structure, and the other circumstances that is important for the study (Granskär & Höglund-Nielsen, 2012). A self-administered questionnaire was therefore advantageous to use. However, the question about level of physical activity was hard to answer for some of the participants, both in terms of prior and after their diagnosis. This could be a reporting error which we had to keep in mind during the analysis.

Manifest qualitative content analysis

A manifest content analysis was chosen for this study since the intention was to do an open-ended interpretation of the material. The focus was to explore the participants' knowledge regarding T2DM and its risk factors and their consumption of SSBs prior to and after their diagnosis. According to Schreier (2012), a manifest content analysis is suitable to use when it comes to analysing the obvious content expressed on a descriptive level, which made this kind of analysis suitable for our study. A manifest content analysis is more standardised than the

latent content analysis, which made it easier for us to use since both of us analysed the data. To interpret texts in a scientific and credible way could be problematic, it requires you to see patterns that sometimes are not fully visible (Granskär & Höglund-Nielsen, 2012). The challenge is to avoid our own preconceptions so it does not control the interpretation. It is about maintaining an open attitude and be self-critical to be able to contribute to new understandings. This attitude was something we strived for through the analysis.

Discussion of results

Knowledge and consumption prior diagnosis

Health literacy
From the result of this study it shows that the participants had insufficient knowledge about T2DM, especially its risk factors, prior to their diagnosis. It has been shown that both diabetics and non-diabetics have poor knowledge about diabetes (Cruz et al., 2013). The lack of knowledge could be a contributing factor to the development of T2DM since poor knowledge could be a cause of less healthy lifestyle choices. The results from this study show that all the participants drank SSBs at least daily or weekly before their diagnosis. The participants' choices to drink SSBs were largely due to the good taste and/or to quench the thirst; some even stated that they felt a craving for it. Instead of drinking water to quench the thirst, the participants drank SSBs without having knowledge of its content or what the consumption of SSBs could lead to in the long run. The subcategory *Lack of knowledge and risk factors* shows that there was little knowledge among the participants before their diagnosis regarding what is good or no good to drink or eat. The choices were, to some extent, based on ignorance, but some of the participants had knowledge that sugar and starchy foods are risk factors for T2DM, which appears in the subcategory *Diet as a risk factor*, yet SSBs were still consumed. This may be in line with the participants' beliefs that what does not concern them does not affect them. Since they did not have diabetes at that time, the consequences of the consumption of SSBs were nothing they cared about. This in turn may be linked with the degree of the participants' health literacy.

Health literacy is known to be associated with health outcomes, including chronic diseases such as diabetes (Protheroe, Rowlands, Bartlam & Levin-Zamir, 2017). Poor health literacy, that is, lacking the ability to engage with health information and service, can according to WHO (2015) result in poor health outcomes. Thus, it could be argued that the participants had poor or lacked health literacy before the diagnosis since it was stated that the participants consumed SSBs without a thought of how it could affect their health.

How the participants defined health was never asked in this study, but it is possible from their statements to do a vague discernment how health was defined. When asked what knowledge the participants had about T2DM risk factors before diagnosis it became clear that what does not concern you, you do not care about. World Health Organization defines health as "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2017), but it appears that health was not something that was considered by the participants until illness had appeared. It would have been interesting to find out more about the participants' view on health to see if this attitude could have affected their health literacy, since according to Joshi et al. (2013) individual's attitudes plays an important part in preventing and managing risk factors for T2DM.

Building understanding
According to Matthaei, Munro and Zinman (2007) it is common that non-diabetics do not have much knowledge about T2DM, especially that T2DM is preventable and that steps can

be taken to minimise the risk of developing the disease. Cruz et al. (2013) also indicate that both diabetics and non-diabetics have poor knowledge about diabetes. These results are in line with the outcomes from this study. To delay the onset of diabetes among non-diabetics it is hypothesized that an increase in health literacy and raised diabetes awareness could be a suitable approach to the problem (Cruz et al., 2013). An intervention to promote healthy living, that is, a process which enables people to increase control over and to improve their health, which could prevent the onset of diabetes is however not an easy task (WHO, 1986; Brooks III, 2013).

A challenge with implementing a diabetes intervention is the wide range of awareness of T2DM that exists in the world and also within different communities in the same country (Matthaei et al., 2007). Brooks III (2013) states that the solutions required needs to be individually adapted and tailored since a personalized approach is paramount. Factors such as health status, ethnicity, education and literacy, family circumstances, language, and culture of each person must be taken into account. In accordance with Matthaei et al. (2007) the results from this study shows that it exists a wide range of awareness of T2DM among the participants. The results show that most of the participants lacked knowledge and were not aware of the risk factors before the diagnosis. In the subcategory *General understanding* it was clarified that some of the participants did not know what T2DM was, only that it existed. Some participants had knowledge of the signs for diabetes and some of the physiological changes that occurs in the body when you are diabetic. Most of the participants also had knowledge that diabetes can be genetic, based on others' experiences. But in general, the participants did not have much knowledge, about what diabetes was or its risk factors before the diagnosis. Therefore, it could be argued that an increase in the participant's health literacy and diabetes-related knowledge and its risk factors before their diagnosis could have contributed to preventing the development of T2DM. Matthaei et al. (2007) contend that the public domain is an important part of raising the awareness of diabetes. Improving public awareness of T2DM and the link between diabetes, obesity, diet and physical inactivity is stated as critical in order to prevent but also manage diabetes. It is suggested that changing beliefs, attitudes and promoting positive behaviours in a combination with building understanding of diabetes could improve people's health and wellbeing. These findings accord with Joshi et al. (2013) who means that people's attitudes and behaviour is crucial when preventing and managing the risk factors for T2DM.

Reasons of consumption
The reasons for consumption of SSBs before diagnosis among the participants were gathered in the category *Refreshing*. Reasons given included good taste and drinking it when it was hot outside. According to Furst, Connors, Bisogni, Sobal and Winter Falk (1996), people's life course experiences have a major influence on food choice that includes ideals, personal factors, resources, social contexts and the food context. There are various frames of reference that are involved in food choice: taste, health, social status and cost. The results in this study indicate that the reasons for SSBs consumption were a combination of attitudes and beliefs about the link between SSBs and T2DM and personal taste preferences. This is in line with Zoellner, Estabrooks, Davy, Chen and You (2012) findings that there is a strong relationship with behavioural intentions and SSBs consumption, followed by attitudes, perceived behavioural control, and subjective norms. Another reason that determines consumption is the price. However, this was not mentioned by the participants in this study. But the price for SSBs has been shown to have an influence of the consumption of SSBs, with a cheap price of SSBs correlating to increased consumption (Veerman, Sacks, Antonopoulos & Martin, 2016).

Knowledge and consumption after diagnosis

Changes in knowledge about type 2 diabetes mellitus and its risk factors
The study results show that the participants have more knowledge about T2DM and its risk factors today than prior to diagnosis and that they have taken the *Knowledge into action.* According to Herre, Graue, Hope Kolltveit and Gjengedal (2015) it is important that people with diabetes can use knowledge to manage their disease. The individual's self-management of the disease is complex and involves the person's daily experiences, since they carry about 95% of their own care (Herre et al., 2015; George & Thomas, 2010). George et al. (2010) defines self-management "as the ongoing process of facilitating the knowledge, skill and ability for diabetes self-care". The knowledge people have about the disease is particularly important for self-management (Herre et al., 2015). To educate diagnosed people with information is essentially to improve their choices, promote better health and reduce complications of T2DM (George et al., 2010). Based on the subcategory *Knowledge of the risks associated with T2DM,* some of the participants were aware of the complications of the disease and could self-manage their disease with the knowledge they had to not face these complications. They noted that it is important to practice safe habits in order to not have an amputation. The subcategory *Lifestyle changes* explain the participants' knowledge about what the right diet is when you are diabetic, such as not to consume too much sugar or starchy foods. The participants' knowledge about the disease affect the changes in their behaviour in terms of their lifestyle (Otero, Zanetti & Ogrizio, 2008). All the participants had knowledge of lifestyle changes such as changes in diet; this could indicate that they increased their knowledge about the disease after their diagnosis. Still, although the participants now have knowledge about the disease it does not indicate that they actually have changed their behaviour (Otero et al., 2008).

Some of the participants have their own reflections of what T2DM risk factors are through their own experiences and source of information which appeared in the category *Experiential knowledge of risk factors.* They mention that stress, depression and overworking could be causes for the diabetes. It has been found that stress can be one of the factors that causes diabetes and it is also an important factor to be aware of in order to maintain a normal blood sugar curve since the stress hormones affect this (1177 Vårdguiden, 2016; Diabetesförbudet, 2016). However, this was only mentioned among a few participants.

Consumption of sugar sweetened beverage after diagnosis
People who are undiagnosed are consuming a higher quantity of SSBs compared with those who are diagnosed (Bleich & Wang, 2011). These results are in agree with our results, in the category *No consumption* it was found that some of the participants do not consume SSBs any longer. The results show that most of the participants do not drink SSBs today, and instead they drink water. Before their diagnosis they consumed SSBs instead of water most times. Bleich et al. (2011) found a positive effect on the diet behaviour among people diagnosed with T2DM by informing them of the importance of a low sugar intake. Many of the participants are aware of that a high intake of sugar is not good for them and maybe this could be one of the reasons why the participants do not drink SSBs today. Research has also shown that people with a high health literacy have better health outcomes, such as drinking less SSBs than those who have a low health literacy (Zoellner et al., 2016). Therefore, it is possible to say that the participants in this study have increased their health literacy since they received their diagnosis.

The category *Continued consumption due to different causes* explains that some of the participants still drink SSBs today due to different causes such as sickness, temptation or

when they feel low. Since research shows that people with lower health literacy consume more SSBs, it may be possible that these participants have a lower health literacy (Zoellner et al., 2016). According to Herre et al. (2015) some people find the disease challenging and can have difficulties motivating themselves in self-management. Since the participants makes many choices every day that can affect their disease, self-management is very important (George et al., 2010). The participants in this study who still drink SSBs, possibly feel that they have some difficulties managing the disease by themselves. It is important that the healthcare professionals have this in mind and are aware of the difficulties that people with T2DM deals with (Herre et al., 2015). The healthcare professionals have also the important role to motivate people with T2DM to self-management. Barriers which could have an impact on self-management is the communication with the healthcare professionals or lack of education that focuses on learning from experience and social learning. It might be that some of the participants face some of these barriers and feel that they cannot self-manage and therefore stills drink SSBs. As mentioned earlier health literacy is about being able to use health knowledge (Stiles, 2011). The participants might have the knowledge about T2DM and its risk factors, but the question is if whether they can use their knowledge in their everyday lives.

As mentioned above, it has been proven that a cheap price of SSBs increases its consumption (Veerman et al., 2016). This could also be a reason why some of the participants still consume SSBs, since water is in the same price range as SSBs on St. Lucia. The range of light products in the stores are also limited in St. Lucia, which could make it difficult for the residents to choose a product with less sugar. A tax on SSBs has been suggested to reduce the consumption of SSBs, and could therefore be a strategy to decrease the consumption (Veerman et al., 2016).

Participant characteristics

Age and health literacy

The participants age range was between 55-84 years old. Research has found that a low health literacy is associated with a higher age (Tang, Pang, Chan, Yeung & Yeung, 2007; Morris, MacLean & Littenberg, 2013). It has been shown that there is a relationship between health literacy and an age-related cognitive decline, and that health literacy may decrease over time (Morris et al., 2013). Older people generally demonstrate a decline in their working memory, such as taking in new information and think of it in different ways. In relation to the participants in this study, it could therefore be argued that they have a lower health literacy today compared to when they were younger. The age range between the participants is quite large and it is possible to discern a difference in the level of knowledge among the participants. The age range may explain the difference in the participants' health literacy. Research also point out that difference in knowledge depends on inequalities of the past regarding health services, proper education and health education (Moodley et al., 2007).

Physical activity

According to the participants, they have the knowledge of what is the right diet when you are diabetic. In addition to too much sugar, they noted that you should not eat too much salt or starchy foods. They are also aware of the importance of a normal portion size. Dietary modification is one of the most important areas for people with T2DM to understand, and this supports informed decision-making and self-managing (Breen, Ryan, Gibney & O'Sheal, 2015). All participants have knowledge of what to eat and not to eat. Another important factor that plays an important role along with T2DM, as many of the participants did not mention, is physical activity (FYSS, 2016). Physical activity is an effective way to increase the sensitivity of cells to insulin, and is therefore an important part of the treatment of T2DM. Education to

address this limited knowledge among the participants may have to be provided in order to reduce the risk of complications. According to our results, most of the participants are only physical active 60-90 minutes per week which is not enough to reach the recommendations on at least 150 minutes per week (FYSS, 2016). However, the data showed that they were more physically active before the diagnosis; this might be due to error reporting. Those participants who are physically active more than 150 minutes per week today mentioned the importance of exercise. Knowledge about the importance of physical activity as a treatment for T2DM can be crucial for diabetics. However, the majority of the participants were over 60 years old, which may affect the level of physical activity.

Body mass index and the development of type 2 diabetes mellitus
The time period since the participants' diagnosis is between one-20 years, which means that the participants developed their diabetes between the ages of 45-74. Research shows that from early adulthood to later in life the risk of obesity increases, and it is common that T2DM develops after midlife (Sun et al., 2016). It is suggested that weight change in early adulthood may influence health later in life, possibly through established patterns. The collected data on the participants' BMI are between 22-35 kg/m². According to WHO (2016c) overweight is a BMI greater than or equal to 25 kg/m² and obesity is a BMI greater than or equal to 30 kg/m². Most of the participants have the BMI 27-35 kg/m² which is classified as overweight or obesity. Obesity is a risk factor for the development of T2DM and also a weight gain in the early adulthood has been shown to have a strong impact on the development of T2DM (Sun et al., 2016). Unfortunately, the study lacked data on participants' BMI prior their diagnosis which makes it difficult to conclude that this could have been a contributing factor to their development of T2DM. But based on their current BMI, it would be possible that this could be a contributing factor.

Conclusion and implications

The findings from this study contribute with an increased understanding about women's knowledge about T2DM and its risk factors in St. Lucia, and also how the degree of knowledge can impact their consumption of SSBs prior to and after diagnosis. Prior to diagnosis the women lacked knowledge about T2DM and its risk factors. The lack of knowledge may have conducted to the consumption of SSBs. Poor or lack of health literacy could also have been a contributing factor. After diagnosis, the women showed an increased understanding of the disease and its risk factors, especially the risk of following an unhealthy diet, and a need to decrease SSBs consumption. This indicates the importance of knowledge about T2DM and its risk factors to reduce the consumption of SSBs which in turn could decrease the growing problem of T2DM. Therefore, improving public awareness of a healthy lifestyle could, as a suggestion, be a way to address the growing problem of T2DM in St. Lucia.

The results of this study could be valuable for health care- and public health professionals in their work to promote a healthy lifestyle and prevent the development of T2DM by increasing people's health literacy about T2DM and SSBs. In the profession as a health promoter, the result of the study can be important as it strengthens the purpose of working with health promotion, rather than prevention, as it shows that knowledge and awareness is an important source to healthy lifestyle choices. However, there is a need of more research about this subject. We hope that this study will bring light to the situation regarding T2DM in St. Lucia and provide a basis for future research regarding this topic. One suggestion is to carry out a similar study in which men and non-diabetics are included to get a more heterogeneous

sample in order to explore how to reach and increase the health knowledge among the population in St. Lucia.

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Appendix

Appendix 1 Interview guide

Opening question

Could you tell us about how you discovered your type 2 diabetes mellitus?

Knowledge about type 2 diabetes mellitus risk factors

What did you know about type 2 diabetes mellitus risk factors prior your diagnosis?

Follow up question

Could you give some examples?

What kind of knowledge do you have about type 2 diabetes mellitus risk factors today?

Follow up question

Could you give some examples?

Consumption of sugar sweetened beverages prior diagnosis

Did you drink any sugar sweetened beverages prior diagnosis?

If yes…

How many servings approximately did you drink per week?

How frequently did you drink sugar sweetened beverages a day?

What kind of sugar sweetened beverage were consumed?

In what situations did you drink sugar sweetened beverages?

What was the reasons behind your consumptions of sugar sweetened beverages?

If no…

If you didn't drink sugar sweetened beverages, what kind of beverages did you drink?

Consumption of sugar sweetened beverages after diagnosis

Do you drink any sugar sweetened beverages today?

If yes…

How many servings approximately do you drink per week?

How frequently do you drink sugar sweetened beverages a day?

What kind of sugar sweetened beverages is consumed?

In what situations do you drink sugar sweetened beverages?

What are the reasons behind your consumptions of sugar sweetened beverages?

If no…

If you don´t drink sugar sweetened beverages, what kind of beverages do you drink?

Conclusion question

Would you like to add anything regarding the subjects that we haven't spoken about?

Appendix 2 Self-administered questionnaire

<u>Background information</u>

1. Age:

2. Occupation:

3. Family structure:

<u>Diagnosis and treatment</u>

4. When did you get your type 2 diabetes mellitus diagnosis?

5. Which type of treatment do you have for your type 2 diabetes mellitus?

<u>Lifestyle</u>

6. Do you smoke or have you smoked? If yes, for how long?

7. How physically active were you during a regular week prior your diagnosis, such as walking, biking or domestic work? Tick one option.

    ☐ Less than 30 minutes every week
    ☐ 30–60 minutes every week
    ☐ 60–90 minutes every week
    ☐ 90–150 minutes every week
    ☐ 150–300 minutes every week
    ☐ More than 300 minutes (5 hours) every week

8. How physically active are you during a regular week at present, such as walking, biking or domestic work? Tick one option.

    ☐ Less than 30 minutes every week
    ☐ 30–60 minutes every week
    ☐ 60–90 minutes every week
    ☐ 90–150 minutes every week
    ☐ 150–300 minutes every week
    ☐ More than 300 minutes (5 hours) every week

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February 17th, 2017

Sofie Elvira Charlotte Bohm
C/o University of Gothenburg
Sweden

Dear Ms. Bohm,

RE: APPLICATION FOR RESEARCH ETHICS REVIEW

The Medical and Dental Council (MDC) wishes to inform that your application for research ethics review of the research project titled "*A descriptive study of the consumption of sugar sweetened beverages among women diagnosed with type 2 diabetes mellitus at St. Jude Hospital in Vieux-Fort, St Lucia, and their knowledge about type 2 diabetes mellitus risk factors*" was reviewed and approved by the MDC's Research Ethics Committee (REC) on 17th February, 2017.

Please be guided that this approval is granted on the understanding that your research will be carried out within the conditions laid out in your proposal, outside of which you will be in violation of the approval.

Also be advised that any serious adverse events or significant changes which occur with regards to this research project and/or which may alter its ethical consideration must immediately be reported to the MDC's REC; kindly note that a form to report on adverse events can be collected at the MDC's Secretariat.
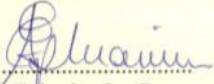
Please see attached the MDC's REC Report Form for monitoring of approved research projects to be completed in its entirety at the interval outlined in the form.
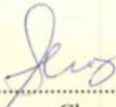
A copy of the results from the completed research project as titled above should be submitted to the MDC as well as the Ministry of Health and Wellness.

The MDC wishes you success in the implementation of your study.

Yours Sincerely,
MEDICAL & DENTAL COUNCIL
Per:

....
Dr. Sherry Ephraim-Le Compte   Mrs. Shereen Chery
Chairperson   Executive Director

cc: Dr. Merlene Fredericks
        Chief Medical Officer
        Ministry of Health

Participants information sheet and consent form

Introduction
We would like to invite you to participate in our bachelor thesis. The purpose of the study is to describe the consumption of sugar sweetened beverages among women from 18 years onwards in Vieux Fort, Saint Lucia, diagnosed with type 2 diabetes mellitus and explore their knowledge about type 2 diabetes mellitus risk factors. In this study sugar sweetened beverage includes e.g. soft drinks, fruit drinks, energy- and vitamin water drinks

Why are we doing the study?
We, Sofie Bohm and Hanna Isacsson, are two students from the University of Gothenburg (Sweden) and this bachelor thesis is a part of our graduation at the Department of food and nutrition, and sport science at the University of Gothenburg, Sweden. It is hoped that this study could provide useful information for healthcare professionals regarding the consumption of sugar sweetened beverages among women with type 2 diabetes mellitus and their knowledge about type 2 diabetes mellitus risk factors.

What will you have to do if you agree to take part?
1. We will arrange a place and time, which is convenient for you.
2. Fill in a self-administered questionnaire regarding your age, occupation, family structure, when the diagnosis was given, type of type 2 diabetes mellitus treatment, use of tobacco and level of physical activity.
3. There will be one single interview with the two of us. We will ask you questions from one questionnaire which affects questions such as your consumption of sugar-sweetened beverage prior and after your diagnosis and questions about your knowledge of type 2 diabetes mellitus risk factors.

How much of your time will the participation involve?
The time you need to put in for your participation is estimated to be around 30-40 minutes.

Which rights do I have as a participant in this study?
As a participant in this study you have rights that will be respected throughout the study:

- **The requirement for information:** you will be well informed about the purpose of the study and what role you will have in it.
- **The requirement for approval:** you have the right to decide on your own participation which means that you have the right to drop out of the study if desired. Furthermore, we will emphasize that the participation in the study is voluntary and it will not be carried out without your consent.
- **The requirement of confidentiality:** information about you will be treated with the utmost confidentiality, e.g. your real name will not be used in the study. Your name will be replaced with a number to ensure confidentiality and all data will be encrypted.
- **The requirement of usage:** this requirement means that the data collected from you will only be used for the study.

What are the advantages of taking part?
You may find the study interesting. The study may also contribute to self-reflection which can lead to an increased awareness regarding your lifestyle choices and diagnosis and an increased knowledge of type 2 diabetes mellitus risk factors.

Are there any disadvantages of taking part?
Data will be collected through an interview, a self-administered questionnaire and anthropometric measurements which will include personal information that could be perceived as uncomfortable, but the study will not expose you to any physical or psychological risks or hazards.

What happens now?
If you are interested in taking part in the study you are asked to sign this form. Then we can arrange a time for an interview that is convenient for you.

This study will touch personal information such as your lifestyle, weight, height, waist circumference and information about your type 2 diabetes mellitus. Therefore, an informed consent will be distributed to all participants. This will be signed by both parties. No compensation will be given for participation.

With this signature, I consent to participate in this bachelor thesis and declare that I have been fully informed about the purpose and which rights I have as a participant.

_____   _____
Participant signature and date   *Sofie Bohm*

                                                            _____
                                                            Hanna Isacsson
                                                             Students signatures and date