KNOWLEDGE, ATTITUDE AND PRACTICE WARDS MANAGEMENT OF GESTATIONAL DIABETES MELLITUS (GDM) AMONG ANTENATAL WOMEN VISITING FOR ANTENATAL CARE AT REPRODUCTIVE HEALTH CENTER, INDIRA GANDHI MEMORIAL HOSPITAL

A RESEARCH THESIS
SUBMITTED
IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR SUBJECT, DISSERTATION (NUR625), MASTER OF NURSING

AISHATH SHEEZA

SUPERVISOR: ASIYA IBRAHIM

SCHOOL OF NURSING
MALDIVES NATIONAL UNIVERSITY

DECEMBER 2022

ACKNOWLEDGEMENT

The author appreciates and express gratitude towards precious guidance, knowledge and time provided by dean, Ms. Asiya Ibrahim to accomplish this research thesis. Moreover, author express gratitude towards Ms. Norazlina Binti Md Jazli who allowed to adapt the questionnaire from her study. In addition, the author wishes to thank all of the esteemed persons in reproductive health center, IGMH for the support they provided during the time of data collection. Author is thankful to participants who contributed their crucial time to participate in the study.

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ABBREVIATIONS

AHEI: Alternate Healthy Eating Index

BMI: Body Mass Index

DASH: Dietary Approaches to Stop Hypertension

DM: Diabetes Mellitus

GDM: Gestational Diabetes Mellitus

GH: Gestational Hypertension

GWG: Gestational Weight Gain

HDP: Hypertensive Disorders of Pregnancy

HIP: Hyperglycemia in Pregnancy

IGMH: Indira Gandhi Memorial Hospital

IADPSG: International Association of Diabetes and Pregnancy Study Groups

KAP: Knowledge, Attitude and Practice

NHA: National Health Academy

NHRC: National Health Research Committee

NICU: Neonatal Intensive Care Unit

PA: Physical Activity

PCOS: Polycystic Ovary Syndrome

PIH: Pregnancy-Induced Hypertension

RHC: Reproductive Health Center

RR: Relative Risk

SPSS: Statistical Package for the Social Sciences

WHO: World Health Organization

ABSTRACT

BACKGROUND: Gestational diabetes mellitus (GDM) is a global health problem compromising maternal and fetal health. The aim of this study is to examine the level of knowledge, attitude and practice towards management of GDM among antenatal women.

METHODS: This is a cross-sectional descriptive correlational study involving 197 antenatal women visiting for antenatal care at Reproductive Health Center (RHC) of Indira Gandhi Memorial Hospital (IGMH). Participants were selected using random sampling in one-month period between August to September 2022. Pearson correlation was used to evaluate relationship between knowledge, attitude and practice towards management of GDM.

RESULTS: Research findings indicate 68% respondents had low knowledge, 16.8% and only 15.2% had high knowledge of GDM. Majority of 80.2% had moderate attitude whereas 16.2% and 3.6% antenatal women were found to have high and low attitude towards GDM respectively. Practice level towards management of GDM were found to be poor in 59.9% participants and good in only 1% of participants. Pearson product correlation indicated significant and moderately positive correlation ($r = .404$, $p < .001$) between knowledge and attitude, statistically significant and weakly positive correlation ($r = .284$, $p < .001$) between attitude and practice. No correlation was found between knowledge and practice towards management of GDM.

CONCLUSION: The results of this study can aid healthcare professionals in developing effective strategies to raise awareness of GDM prevention in the Maldives and in carrying out health promotion activities related to GDM successfully

CHAPTER 1: INTRODUCTION

GDM is one of the most prevalent metabolic conditions during pregnancy around the world which attributes to not only the risk to maternal health, but their newborns are also at risk for complications during birth. There are five different sections in this introduction chapter. First section entails background of the research topic and second section explains relevance and justification of the topic to Maldivian context. Third section focuses on the problem statement. Fourth section describes purpose, objectives and research questions and the fifth section closes with the definition of main terms of the research.

1.1. BACKGROUND

GDM is varying grades of abnormal glucose metabolism or glucose intolerance that begins during pregnancy (Kc et al., 2015). Pregnancy causes insulin resistance due to secretion of placental hormones such as prolactin and estrogen which have insulin-dependent effects causing subsequent hyperglycemia (Choudhury & Devi Rajeswari, 2021). International Diabetes Federation (2021)stated GDM as a global health problem which might affect one in four births. Globally, the prevalence of GDM has been on the rise, with 13.9% of all pregnancies predicted to be affected (G. Li et al., 2020). International Diabetes Federation (2021) 21.1 million live births around the world were affected by hyperglycemia in pregnancy (HIP) in 2021 and the reason for 80.3% of these cases were found to be GDM. Moreover, the highest comparative prevalence was found in south east Asia which was 28% (International Diabetes Federation, 2021). According to a meta-analysis, the prevalence of GDM varies from 14.0 % in Africa to 5.4 % in Europe and it ranges from 0.7 to 51.0 % in Asian countries (Lee et al., 2018). Maldives health profile 2019 identified a significant increase of non-communicable disease in Maldivian population and a higher rate of maternal and perinatal conditions among inpatient conditions (Ministry of Health, 2021). However, incidences or prevalence of GDM and knowledge, attitude and practice (KAP) of management of the

condition among Maldivian population have not been published in any paper as per the knowledge of the author.

A study in Germany indicates that neonatal complications including macrosomia, hypoglycemia and stillbirths, and obstetrical complications including cesarean delivery, gestational hypertension, premature rupture of membranes, placenta abruption, and postpartum hemorrhage are highly prevalent with GDM (Domanski et al., 2018). Although GDM normally recovers after delivery, it poses long-term implications of obesity, GDM in subsequent pregnancies and an increased likelihood of developing type 2 diabetes mellitus (DM), increasing global prevalence of type 2 DM (Eades et al., 2015; Z. Li et al., 2020).

An adequate level of knowledge of GDM includes antenatal women's understanding of risk factors, risk of GDM on maternal and fetal health, normal glycemic control, food limits, nutritional need, and the need of physical exercise (Hod et al., 2015; Hussain et al., 2015; Mohebbi et al., 2019). Poor knowledge is linked to a lack of understanding and awareness of disease and limited healthy lifestyle management, as a result, to a slew of negative health consequences (Mahmoodi et al., 2018; Pirdehghan et al., 2020; Sayakhot et al., 2016). Knowledge promotes quality of life through a healthy lifestyle and it can also assist women in navigating through pregnancy with reduced complications (Mahmoodi et al., 2018).

Knowledge facilitates antenatal women's attitude and practice towards health seeking, monitoring of blood glucose, normal weight gain, healthy nutritional intake and physical exercise (Alharthi et al., 2018). Pregnant women with hyperglycemia and higher risk of GDM require appropriate attitude, such as anticipated achievement goals, a high sense of confidence, positive reinforcement, and the adequate motivation to achieve their intended goals, in addition to knowledge and coping practices (Al-Hashmi et al., 2018). Moreover, studies provide evidence that a proper nutritional intake, moderate exercise, weight management and routine monitoring of blood glucose can help pregnant women control their glycemic levels and

prevent or manage GDM (Brown et al., 2017; Sayakhot et al., 2016). Inadequate compliance with healthy behaviors is a big issue, particularly during the relatively brief period of pregnancy. It is critical for antenatal women to actively involve and enhance their ability for choosing healthy choices throughout gestation in order to promote maternal and newborn health (Al-Hashmi et al., 2018). Therefore, knowledge of GDM is an important aspect for maintaining a normal glycemic control and positive self-care practices before and throughout the pregnancy, which will contribute for early diagnosis, management and reduction of complications to maternal and fetal health (Alharthi et al., 2018; Byakwaga et al., 2021). Thus, it is imperative to understand any gap in KAP towards management of GDM among antenatal women to identify health and educational needs, which will help to implement effective interventions. Moreover, understanding any lacking aspect of KAP will contribute to the effective management and prevention of the condition.

1.2. RELEVANCE AND JUSTIFICATION

Obesity, family history of DM and maternal age have all been identified in several studies as key risk factors for an increase in the prevalence of GDM (Demirel et al., 2020; Groof et al., 2019; Larrabure-Torrealva et al., 2018). Antenatal women with GDM have considerably higher body mass index (BMI), age, parity, and first-degree family history of DM than non-GDM women (G. Li et al., 2020). Though GDM is generally a transient condition that occurs during pregnancy and disappears after delivery, it holds a higher risk of GDM in later pregnancies and development of type 2 DM three to six years following GDM and can arise before the age of 40 (Z. Li et al., 2020). Infants born to women with GDM are more likely to be obese and have increased lifetime likelihood of developing type 2 DM later in life (International Diabetes Federation, 2021). Negative maternal and fetal outcomes are common with GDM and these include hypertensive disorders, pre-eclampsia and macrosomia making a normal birth extremely challenging, putting the newborn at risk of nerve damage and fractures (Domanski

et al., 2018; Kc et al., 2015). Early detection and appropriate management of modifiable risk factors, which includes adopting a healthy lifestyle of having optimal weight gain, adequate physical exercise and well-balanced meals throughout the pregnancy can considerably lessen these negative maternal and fetal outcomes (Gorbán de Lapertosa et al., 2021; Mizgier et al., 2021; Sedaghat et al., 2017). Furthermore, early diagnosis of GDM provides an opportunity to avoid negative pregnancy outcomes and modify one's lifestyle in order to prevent subsequent development of DM from developing (Muche et al., 2019). For settings with limited resources, early diagnosis and prevention of GDM will be a more attainable and cost-effective approach for healthcare (Gorbán de Lapertosa et al., 2021).

Given a glance at statistics of Maldivian population, risk factors of GDM such as obesity and higher maternal age are identified to be prevalent among reproductive age women. According to the Maldives Health Statistics 2020, 47.79% antenatal women's maternal age was above 30 (Ministry of Health, 2021). Above 35 years of age is considered as higher maternal age according to Ministry of Health (2021b). Moreover, according to a study conducted by Hashan et al. (2020) based on Maldives Demographic and Health Survey 2016-17, 63% of women at reproductive age (15–49 years) were overweight or obese. According to International Diabetes Federation, (2022, February 10), the prevalence of DM in adult Maldivian population in 2021 is 6.7%. According to Health Statistics 2020, Maldives has a crude birth rate of 17 live births per 1000 population in 2019 and 2020 (Ministry of Health, 2021b). Ministry of Health, (2021) also identified 20% maternal and 5.5% perinatal conditions among all inpatient conditions in 2020.

Given that Maldivians are South Asians and the higher maternal age, obesity and prevalence of DM in the Maldives, Maldivian women are at higher risk for GDM. Therefore, it is vital to assess the KAP towards management of GDM as lack of knowledge and poor lifestyle practices

hinders the prevention and early detection of the condition. Moreover, (Muche et al. (2019) found that glycemic control was more common in women with healthy diet, regular exercise and weight control which enhanced prevention or delaying the onset of GDM. Studies also indicate that educational interventions on GDM improved women's self-efficacy to physical exercise, healthy eating (Harrison et al., 2020), and self-adherence to healthy lifestyle habits (Al-Hashmi et al., 2018). As knowledge, attitude and practice assessment is a vital aspect of patient education, this research can offer important data on understanding the educational needs which can help to implement educational interventions.

1.3. PROBLEM STATEMENT

Overweight and obesity are the most powerful risk factors for GDM, with relative risks of 2–3 and 5–6 times higher than women with normal-weight (Aune et al., 2016), with risk remaining higher with advanced maternal age and family history of DM (International Diabetes Federation, 2021). With increasing prevalence of these risk factors, importance should be given to management of practices during pregnancy to prevent or manage GDM and this depends on KAP of pregnant women regarding GDM. A KAP study is necessary to gain a better understanding of the community's perceptions of disease conditions and the way patients live with it. A KAP study vital to learn more about how GDM-related attitudes and beliefs impact aspirations and actual practices among pregnant women in Maldives. The current study will thus assist health care practitioners in Maldives in identifying which parts of the KAP of pregnant women towards GDM need to be reinforced in order to enhance positive habits among them. KAP assessment is a vital aspect of education. Pregnant women must be educated about the measures that have been linked to the prevention of GDM in order to promote self-care among them. Present study can also aid nursing and educational interventions for promoting self-care ability and knowledge.

1.4. PURPOSE OF THE STUDY, OBJECTIVES AND RESEARCH QUESTIONS

Purpose: to examine the level of knowledge, attitude and practice towards management of GDM among antenatal women visiting for antenatal care RHC of IGMH.

Objectives

- To estimate the level of GDM knowledge, attitude and practice towards management of GDM among antenatal women.
- To assess the relationship between GDM knowledge and the attitude of antenatal women towards management of GDM.
- To assess the relationship between GDM knowledge and practice of antenatal women towards management of GDM.
- To assess the relationship between attitude and practice of antenatal women towards management of GDM

Research Question

1. What is the estimated level of knowledge, attitude and practice towards management of GDM among antenatal women?
2. What is the relationship between GDM knowledge and the attitude of antenatal women towards management of GDM?
3. What is the relationship between GDM knowledge and practice of antenatal women towards management of GDM?
4. What is the relationship between attitude and practice of antenatal women towards management of GDM?

Hypothesis

1. There is a significant relationship between GDM knowledge and the attitude of antenatal women towards management of GDM.
2. There is a significant relationship between GDM knowledge and practice of antenatal women towards management of GDM.
3. There is a significant relationship between the attitude and practice of antenatal women towards management of GDM.

1.5. DEFINITION OF TERMS

Conceptual Definitions

GDM: a type of diabetes in which a woman develops elevated blood glucose levels recognized first during pregnancy, although not to the same extent as overt diabetes. (International Diabetes Federation, 2021).

Antenatal women: women with pregnancy before delivery (Mosby, 2016).

Attitude: personality development forces influencing behavior of an individual which portray individual's beliefs about circumstances that are right or wrong, good or bad, desirable or undesirable (Mosby, 2016).

Management of Practice: habits often performed routinely or customarily in order to manage something (Merriam-Webster, 2016).

Knowledge: understanding, familiarity or awareness of something gained from association or experience (Merriam-Webster, 2016).

Operational Definitions

GDM: Varying grades of abnormal glucose metabolism or glucose intolerance that begins during pregnancy (Kc et al., 2015).

Antenatal women: pregnant women receiving medical care during pregnancy.

Knowledge: Awareness of GDM among antenatal women. This was measured by using a pre-tested questionnaire adapted from Md Jazli et al., (2021) which has 12 questions on knowledge of GDM, each right answer with 1 point and with a total maximum score of 12 points. Knowledge was categorized as low, moderate and high.

Attitude: The way antenatal women think and behave toward GDM. This was measured with the questionnaire adapted from Md Jazli et al. (2021) which has 10 questions with a total maximum score of 50 points on attitude with five-point Likert's scale answers of strongly agree, agree, neutral, disagree and strongly disagree. Mean score was generated from total responses to categorize low, moderate and high attitude.

Practice: The lifestyle behaviors antenatal women practice to prevent GDM. This was also measured with the questionnaire adapted from Md Jazli et al. (2021) which has 9 questions with a total maximum score of 27 points on practice with three-point Likert's scale responses of never, sometimes, and frequently/always. Mean score was generated from total responses to categorize good, moderate and poor practice.

CHAPTER 2: LITERATURE REVIEW

A considerable number of studies have been published relating to GDM. This literature review was done to locate the available literature on the multiple elements of the study topic and to identify relevant and appropriate resources. The search was conducted using several electronic databases, including Pubmed, CINAHL; (EBSCO), Medline, HINARI; Science Direct, Ovid. In addition, the search engine Google Scholar was also utilized. In order to locate relevant studies, the reference lists of available articles have been also searched. GDM, risk factors, fetal complications, maternal complications, knowledge, attitude, practice, lifestyle interventions, physical activity, diet, gestational weight gain, and educational interventions were all used as keywords. The search was restricted to studies conducted from 2015 to 2022 and resources of English-language. The literature review is organized into non-exhaustive six topics contextualizing the essence of the current study. First topic comprises review on 'prevalence of GDM', followed by 'risk factors contributing to GDM' and 'maternal and fetal outcomes attributing from GDM' on second and third topic respectively. 'Knowledge, attitude and practice of GDM' is reviewed on fourth topic followed by 'risk of lifestyle practices on GDM' and 'effect of educational interventions on knowledge and self-care' on fifth and sixth topic respectively.

2.1. PREVALENCE OF GDM

A significant number of studies were conducted on the prevalence of GDM. Prevalence of GDM around different countries and regions around the world and among different races has been published in a significant number of different studies. GDM prevalence is a vital aspect as GDM causes negative consequences on maternal and fetal health along with negative impacts on healthcare.

There is a vast disparity in prevalence rates in different countries depending on differences in ethnicity, lifestyle, diagnostic criteria and population characteristics (Hod et al., 2015).

According to a systematic review by Aydın et al. (2019), the global prevalence of GDM is 16.2%, with no considerable variability between rural and urban areas. A systematic meta-analysis identified that the prevalence of GDM in Asia as 11.5% and it also suggested that prevalence varies from 5.4% in Europe to 14.0% in Africa and it ranges from 0.7 to 51.0% in Asia (Lee et al., 2018). Another meta-analysis of Eastern and Southeast Asian countries found a 10.1% overall prevalence of GDM. GDM was found to be 64% more prevalent in low- and upper-middle-income nations than in high-income countries (Nguyen et al., 2018). According to a systematic review study by Paulo et al. (2021), the overall GDM prevalence in 24 European counterparts was calculated to be 10.9 %. Eastern Europe had the greatest GDM prevalence (31.5%), followed by 12.3% in Southern Europe, 10.7% in Western Europe and 8.9% in Northern Europe. Another meta-analysis by Al-Rifai et al. (2021) found that the combined prevalence of GDM among 16 Middle Eastern and North African countries was 13.0% and Qatar had the highest prevalence (20.7 %), while sub-regionally it was highest in Gulf States (14.7%). The same study revealed that women with maternal age over 30 years old (21.9%), gestational age of third trimester (20%), and with an obese BMI (17.2%) had a significantly higher prevalence of GDM (Al-Rifai et al., 2021). Similar findings of GDM prevalence being significantly associated with higher BMI, advanced maternal age and gestational age were revealed in more studies (Aydın et al., 2019; Eades et al., 2017; Paulo et al., 2021; Swaminathan et al., 2020).

According to (Chen et al., 2019), Asian American women had a cumulative prevalence of 15.5%, followed by non-Hispanic black women with 9.0%, Hispanic women with 10.7%, and non-Hispanic white women with 7.9%. This study also revealed that there was 2.44 times the risk of GDM associated with Asian race, regardless of pre-pregnancy BMI, maternal age, or physical activity (Chen et al., 2019). A study based on World Health Organization's (WHO) current diagnostic criteria found a 48.5% incidence rate among Omani women; nevertheless,

when using the previous criteria, this rate reduced to 26.4% (al Subhi et al., 2021). Furthermore, among women with GDM identified using the most recent criteria, incidence of maternal and newborn complications such as pregnancy-induced hypertension (PIH), polyhydramnios, and premature delivery were higher (al Subhi et al., 2021). A similar kind of study found that implementing the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria was related with a 75% rise in the incidence of GDM with indications of heterogeneity (Saeedi et al., 2021).

Though establishment of quantitative data on prevalence of GDM is an important aspect for maternal and fetal health, prevalence rate of GDM in Maldivian population has not been published in any paper.

Currently published studies evidence that prevalence rate of GDM varies in different regions of the world and among different races. It was indicated that Asian women have a higher risk of GDM development. Moreover, prevalence rate was found to be different when different diagnostic criteria such as WHO criteria and IADPSG criteria is utilized to diagnose GDM.

2.2. RISK FACTORS CONTRIBUTING TO GDM

A Considerable number of studies have been published regarding risk factors of GDM. Prevalence and incidences of GDM in a population increases when associated risk factors are significant in that population. This makes knowledge of risk factors, a crucial aspect in developing and utilizing preventive strategies to reduce GDM in a population.

A Canadian study showed that the likelihood of getting GDM rises linearly with increased maternal age (Schummers et al., 2018) and a study among Chinese women indicated that this occurs regardless of BMI (Li et al., 2020). Similarly, a series of studies conducted in Germany, Kuwait and Finland found higher incidence of GDM diagnoses in antenatal women with no prior history of DM in their last pregnancy, and that the incidence of GDM was linked to higher

pre-pregnancy BMI and advanced maternal age (Domanski et al., 2018; Groof et al., 2019; Laine et al., 2018). A study among Indian women has also explored that the prevalence rate of GDM rose with age, going from 1% at age of 15 to 19 years old to 2.4 % at 35 years old (Swaminathan et al., 2020). Additionally, a meta-analysis reported that the risk of GDM was considerably greater in Asian women aged above 20 years than in women aged below 20 years, with the risk increasing by 7.9% for each year raised from 18 years (Li et al., 2020).

Insulin resistance develops as a result of elevated insulin sensitivity in overweight and obese antenatal women, contributing to the emergence of GDM and adverse pregnancy outcomes (Petrova Genova et al., 2019). A systematic review by Najafi et al. (2019) have made contributions to evidence this and found that each point of increase in BMI raised the probability of GDM by 14 to 19 %. Similarly, other studies indicate that antenatal women with central obesity have a 2.75% risk of having GDM (Yao et al., 2020), and they have a 1.64-fold higher likelihood of developing GDM (Larrabure-Torrealva et al., 2018). Likewise, according to a systematic analysis, the incidence of GDM was 2.14 times higher in antenatal women aged 30 (in comparison with 15-29 of age), 1.47 times greater in the third trimester (in comparison with second trimester), 2.29 times higher in women with overweight BMI, and 6.79 times higher in women with obese BMI (Paulo et al., 2021).

Since family history of DM is a significant GDM predictor, assessing family history of DM in antenatal women is critical for GDM screening and improving maternal and neonatal health (Moosazadeh et al., 2017). An Iranian study by Moosazadeh et al. (2017) articulated that the family history of DM had a 3.46-fold increased likelihood of acquiring GDM. Comparably, a study with a 16 % incidence of GDM among Spanish women, antenatal women with a family history of DM held a 1.5-fold increased risk of GDM development (Larrabure-Torrealva et al., 2018). Whereas, a study in Bulgaria by Borissov et al. (2021) found that antenatal women with GDM had a 29.1% higher prevalence of family history of DM as a risk factor. Additionally, a

study in Israel emphasized that even after adjusting for other factors, family history of DM in first-degree relatives and pre-pregnancy BMI persist as predisposing and independent predictors for GDM (Shargorodsky et al., 2017).

A study among women in Saudi Arabia revealed that GDM is among the most common pregnancy-related unfavorable outcomes in multiparous women, with 12.6% of multiparous pregnancies having GDM(Al-Shaikh et al., 2017). Though GDM normally goes away once the pregnancy is over, antenatal women with GDM have a much-increased chance of acquiring GDM in subsequent pregnancies (International Diabetes Federation, 2021). Further studies conducted in United States, England and China have found that GDM recurrence is common, with approximately half (or more) of antenatal women having a history of GDM in first parity experiencing GDM recurrence in future pregnancies (Egan et al., 2021; England et al., 2015; Wang et al., 2019; Zhang et al., 2022). Comparable findings were developed by Schwartz et al. (2015), with 48% of GDM prevalence, the risk of recurrence for multiparity pregnancies was much higher than for nulliparous women. Kruse et al. (2015) also revealed similar findings with a 47.2% prevalence of recurrence rate for GDM among antenatal women in Denmark and found that women who reduced their BMI in between the first and following pregnancies had a reduced risk of recurrence for GDM.

Reviewed literature shows that maternal age, obese and overweight BMI, family history of DM and multiparity increases the likelihood of developing GDM. Moreover, women having more than one of these risk factors are more susceptible to develop GDM.

2.3. MATERNAL AND FETAL OUTCOMES ATTRIBUTING FROM GDM

A number of maternal and fetal complications associated with GDM have been reported in a significant number of existing studies. Literature indicated significant complications that attribute from GDM evidencing the substantial threat it causes on maternal and fetal health. This necessitates establishment of data on KAP of GDM imperative to encourage preventive

attitude and practices among antenatal women to manage and prevent complications associated with it.

Gascho et al. (2017) evaluated cesarean rate among antenatal women with GDM women in Brazil and found that cesarean births accounted for 57.4% of pregnancies and cesarean rates were higher in women with advanced maternal age and a higher BMI. According to a study in Israel by Ganer Herman et al. (2017), trial of labor was attempted in only 10.1% of pregnant women with GDM, contrasted to 50.5% of women without GDM, and among these women with GDM, only 4.6% delivered vaginally. Similar findings are established by a study in Poland by Grabowska et al. (2017) and articulated 53% of cesarean deliveries among GDM pregnancies and also revealed that spontaneous uterine contractions were only achieved by 12% of women.

Hypertensive disorders of pregnancy (HDP) additionally aggravate fetal and maternal morbidity in GDM pregnancies. In a Brazilian study of antenatal women with GDM, HDP incidences were assessed in 19.5% of women, with gestational hypertension (GH) accounting for 9.2% and preeclampsia accounting for 10.3% (dos Santos da Silva et al., 2017). Women who had GDM during a prior pregnancy had a greater risk of HDP (dos Santos da Silva et al., 2017). Comparably, prospective research in India intended at determining the fetal and maternal outcomes in antenatal women with GDM, 25% of mothers had GH and 6.4% had chronic Hypertension (Thiruvikrama Prakash et al., 2017).

Amongst common long-term consequences of GDM includes development of type 2 DM and a study in United States and a meta-analysis indicated that it has a significantly higher relative risk (RR) after 3-6 years of GDM diagnosis and RR remains higher after that and can develop before age 40 (Gadgil et al., 2017; You et al., 2021). A systematic review by Vounzoulaki et al. (2020) reported a 16.46% incidence of type 2 DM in mixed ethnicity of women previously diagnosed with GDM and revealed that development of type 2 DM in these women was 10

times higher. Comparable findings were found in a systematic review by Dennison et al. (2021) which discovered that women diagnosed with GDM had a 12% higher probability of developing type 2 DM per each year after GDM diagnosis. Furthermore, Type 2 DM development was shown to be higher in Asian women, as well as those who were older and had a higher BMI, according to a systematic analysis of twenty-eight studies (Li et al., 2020).

In GDM, diminished glycemic control and elevated serum glucose levels induce the fetal pancreas to release insulin, contributing to hyperinsulinemia, which increases fetal protein and fat stores, causing macrosomia (Kc et al., 2015). An African cohort study found GDM exposure was related with substantial fetal development measurements, particularly belly circumference, which was more notable in male babies (Macaulay et al., 2018). Moreover, Macrosomia was exceptionally prevalent in GDM pregnancies independent of other variables, according to a meta-analysis by (X. J. He et al., 2015). When compared, women with normal glycemic levels, 15–45% of neonates delivered to GDM pregnancies had macrosomia, which raised the probability of neonatal hypoglycemia, shoulder dystocia and neonatal jaundice (Kc et al., 2015). Additional influential evidence was emphasized in a study in China which found that newborns of GDM pregnancies had a higher placental weight and a higher risk of newborn infection (Li et al., 2020).

Because maternal hyperglycemia increases hyperinsulinemia in neonates, neonatal hypoglycemia develops in neonates born from women with poor glycemic control (Begum et al., 2018). 42.3% incidence rate of neonatal hypoglycemia was reported in pregnancies with GDM and 56.8% in pregnancies with pre-gestational GDM in a study in Bangladesh by Begum et al. (2018). Similarly, another study in Australia reported that likelihood developing hypoglycemia raised 1.1 times higher for each mmol/l increase in maternal fasting glycemic level, 1.8 times higher with per week of gestational age in which GDM was diagnosed and 10.8 times higher with parity times (Thevarajah & Simmons, 2019). This study also articulated that

neonatal hypoglycemia was related to 2.8 times higher risk for macrosomia and 5.4 times higher risk for shoulder dystocia (Thevarajah & Simmons, 2019). According to Thiruvikrama Prakash et al. (2017), 20% of neonates born to antenatal women in India with GDM underwent admission in Neonatal Intensive Care Unit (NICU) and 3% died.

Significantly adverse maternal and fetal complications are prevalent in cases with GDM as evidenced by reviewed literature. Incidence of maternal complications associated with GDM included cesarean deliveries, HDP, GH and preeclampsia. Development of type 2 DM in future was found as a long-term complication of GDM. Macrosomia, neonatal hypoglycemia and admission in NICU was indicated as frequently occurred fetal complications arise from GDM.

2.4. KNOWLEDGE, ATTITUDE AND PRACTICE OF GDM

Pregnant women's knowledge towards GDM has been well studied. Knowledge is an important factor to encourage positive attitude and preventive practices. Thus knowledge, positive attitude and preventive practices of GDM among antenatal women is important to reduce incidence of GDM and complications related to it. Lack of these aspects necessitates to implement more suitable educational and preventive strategies.

A series of previous studies done in Bangladesh, Uganda, Malaysia and India, to evaluate the knowledge of GDM among antenatal women showed that age, educational level and family history of DM were significant predictors for GDM knowledge (Bhowmik et al., 2018; Byakwaga et al., 2021; Hussain et al., 2015; Lakshmi et al., 2018; Prabhu J et al., 2021). According to a study conducted in Tamil Nadu, only 35.2 % of pregnant women had sufficient understanding of GDM and sufficient knowledge of its risk factors was demonstrated by 21.5% of women (Lakshmi et al., 2018). Another study in Zambia by Yizukanji & Mwanakasale (2018) also found that 64.4 % of antenatal women were not aware of GDM. Contrastingly, in a cross-sectional study conducted in Samoa, 58% of antenatal women had awareness that GDM

develops during pregnancy for the first-time, however risk factors of GDM were correctly identified by only one woman (Price et al., 2017). Regular exercise (78%) and healthy nutrition (79 %) were identified by the majority of women as appropriate lifestyle adjustments to prevent GDM (Price et al., 2017). Similar findings were demonstrated in a study conducted by Hussain et al. (2015) to evaluate the knowledge of GDM among women in Malaysia and revealed that they had higher awareness of the diet needs (76.6%).

Limited quantity of research has been published on the attitude of antenatal women towards GDM. A study done in Bangladesh by Islam et al. (2017) identified a majority of 60.7% obese antenatal women with poor knowledge of GDM, however 23.3% demonstrated a positive attitude towards glycemic control and GDM education program. Similarly, another study done in India found 62% antenatal women with GDM had a favorable attitude towards DM with a mean attitudinal score of 21.68 ± 3.95 (Noronha et al., 2018). A study conducted in Iran also showed a mean score of knowledge in antenatal women as 20.77 ± 5.71 indicating an average attitude about GDM and 7.7% with poor attitude (Khanpaye et al., 2019). Likewise, comparable findings were noted in a study conducted in Chennai to assess the KAP of antenatal women towards GDM, in which 54.21% expressed physical exercise during pregnancy as healthy and 44.21% expressed following a healthy dietary regimen as important (Shafaiyaz & Rohini, 2021). However, a study by Herath et al. (2017) done in Sri Lanka showed a majority of 90% of antenatal women with a poor attitude towards GDM.

Notable amount of recent literature has been published on practice towards management of GDM. A study conducted in Malaysia found that 54.1% antenatal women had good practice towards GDM and it also revealed that one-point rise in knowledge correlates to a 0.059 increase in practice, while a one-point rise in attitude correlates to a 0.088 increase in practice (Md Jazli et al., 2021). Similarly, in another study conducted in Ethiopia found that 33.4% antenatal women were engaged with regular physical exercise and 51.5% with adequate

nutritional intake and normal glycemic control were more common among these women (Muche et al., 2019). In contrast poor practice was showed in a study among Sri Lankan women, articulating that half of pregnant women never had their blood glucose levels checked, 65% consumed refined sugar often, and a majority of 80 % did not practice regular physical exercise (Herath et al., 2017). A study conducted in Bangladesh revealed antenatal women's lack of knowledge on GDM, its effect on fetus and blood glucose monitoring as barriers of practice towards prevention of the condition (Biswas et al., 2020).

Attitude and practices of Maldivians that are highly associated with the risk of GDM as evidenced from the online publications from government international organizations. World Health Organization (2017, October 25) stated that unhealthy lifestyle habits of consumption of sugary beverages and tobacco was significantly associated with the rising non-communicable disease burden in Maldivian population requiring the interventions to encourage a healthy lifestyle. Moreover, UNICEF (2020) articulated that less than 6.5% of Maldivian population consume healthy foods and obesity among the population was significantly associated with lack of knowledge of appropriate nutrition, high consumption of unhealthy and packaged foods. Other papers also stated that a sedentary lifestyle is increasing among Maldivians along with high dietary energy intake from sugary beverages and dense, fatty, sugary, and processed foods (Maldives Partnership Forum, 2019; Ministry of Health, 2017).

Literature shows KAP of management of GDM among antenatal population of different countries varies. KAP among antenatal women in Maldives has not been published in any paper. However, attitude and practice among overall Maldivian population shows poor lifestyle practices such as consumption of unhealthy foods and sedentary lifestyle which can lead to development of GDM.

2.5. RISK OF LIFESTYLE PRACTICES ON GDM

In a significant number of epidemiological studies, physical activity, nutrition, and weight gain during pregnancy have all been linked to the risk of GDM. A number of lifestyle practices has been found as increasing the risk of GDM and utilizing healthy lifestyle practices was articulated as decreasing the risk of GDM. Knowledge of unhealthy practices and risk of these practices is important as it encourages antenatal women to engage in a healthy lifestyle as their attitude improves.

According to a Swedish cohort study, every 1-point rise in antenatal women's lifestyle score was linked to a 21% decreased risk of GDM (Badon et al., 2017). Diet is a vital part of lifestyle practice which plays an important role in reducing or increasing the risk of GDM. Western dietary pattern is high in daily fat and energy intake and consists sweets, salty snacks, potatoes, high-fat dairy products, potatoes, processed foods, eggs, meat, soft drinks, coffee, and tea (Sedaghat et al., 2017). Studies in Poland and Tehran showed that consuming a western diet before and during pregnancy was substantially related with the risk of GDM (Mizgier et al., 2021; Sedaghat et al., 2017). Contrastingly, (Hu et al., 2019) investigated the impact of dietary patterns on the risk of GDM among antenatal women in China and reported that a diet rich in fruits, vegetables, and rice was linked to a reduced risk of GDM, whereas a diet rich in whole grains and seafood was linked to a greater risk of GDM. The Mediterranean diet, the Alternate Healthy Eating Index diet (AHEI) and the Dietary Approaches to Stop Hypertension (DASH) were found to be linked with a 15–38 % lower relative incidence of GDM in a systematic review of dietary studies by Mijatovic-Vukas et al. (2018). Meat or processed meats, potatoes and protein originating from meat, on the other hand, were linked to higher risk of GDM (Mijatovic-Vukas et al., 2018). Melero et al. (2020) conducted a study in Spain with a nutritional intervention and discovered that incidences of GDM in the intervention group (13.4 %) was lower than the control group (25.8 %). Emergency cesarean sections, urinary tract

infections, and perineal injuries were all reduced in the intervention group, according to this study (Melero et al., 2020). Moreover, a study in China by (Song et al., 2016) zhanrevealed a 18% reduced risk of GDM with either diet or physical activity (PA) in the antenatal period and a systematic review by Griffith et al. (2020) identified that PA combined with diet significantly reduced the risk of GDM.

A study in China by Liang et al. (2019) revealed that antenatal women with advanced maternal age with high gestational weight gain (GWG) in the first trimester have higher risk of developing GDM and the risk becomes higher in the second trimester regardless of maternal age. Sanabria-Martínez et al. (2015) conducted a meta-analysis and found that physical exercise programs reduced the risk of GDM (RR = 0.69), especially when the physical exercise program was carried out through pregnancy (RR = 0.64) and it also reduced maternal weight gain (Sanabria-Martínez et al., 2015). Similarly, a systematic review and study in China also found that PA interventions and leisure time PA prior and throughout the pregnancy reduces the total RR for GDM (Aune et al., 2016; Juan & Yang, 2020). Comparably, a study in Iran by Nasiri-Amiri et al., (2016) indicated that antenatal women with low total PA especially in first 20 weeks of pregnancy had a considerably increased chance of developing GDM than those with higher PA levels. Similar findings were developed in a systematic review by Mijatovic-Vukas et al. (2018) and found that any PA during pre-pregnancy or early pregnancy was linked to a 21% and 30% lower risk of GDM, respectively, as compared to no PA. This study also revealed that performing pre-pregnancy active leisure PA more than 90 minutes per week was linked to a 46% lower risk of GDM (Mijatovic-Vukas et al., 2018). Similarly, Davenport et al. (2018) also found that PA and PA along with other co-interventions lowered the risk of GDM and reported that antenatal women should perform moderate activity of at least 600 met-min/week to reduce their chances of developing GDM by at least 25%. A systematic review

also revealed a reduced risk of 28% when PA interventions were performed during pregnancy (Russo et al., 2015).

Western diet, lack of activity and higher pregnancy weight gain was found to be increasing the risk of GDM. However, engaging in healthy lifestyle practices including making healthy dietary changes into daily menu and physical exercise was indicated by literature as reducing the likelihood of GDM development.

2.6. INTERVENTIONS TO IMPROVE KNOWLEDGE, ATTITUDE AND SELF-CARE PRACTICES TOWARDS MANAGEMENT OF GDM

Educational interventions on GDM to improve the awareness, knowledge and self-care practices has been studied in a substantial number of studies. Lack of knowledge and self-care among antenatal women contributes to poor attitude and lifestyle practices which increases the likelihood of developing GDM and complications related to it endangering the maternal and fetal health. Educational interventions are crucial part in reducing incidences of GDM through encouraging women to engage in healthy practices.

A meta-analysis reviewing papers regarding educational interventions for self-care including diet, PA, blood glucose monitoring found that these interventions were successful in improving awareness and knowledge of antenatal women and in reducing adverse pregnancy outcomes (M. C. Carolan-Olah, 2016). Similarly, a health education intervention for GDM was integrated in a Chinese and a Dutch study and identified that GDM awareness rate, compliance with self-care management, normal GWG, normal glycemic control and positive pregnancy outcomes was significantly higher in the intervention group (He et al., 2022; Minschart et al., 2020). Provision of health education about PA and diet for women with GDM also proved to improve self-efficacy and knowledge of GDM in studies (Al-Hashmi et al., 2018; Harrison et al., 2020). Similarly, Egyptian study by (El-Ansary & Fouad, 2020) articulated educational sessions improving knowledge, attitude and practice of antenatal women with GDM with an increased

knowledge level of 77.3%, increased attitude score of 91.8% and improved self-care score of 90.7%. Comparable findings were established in study by (Gorbán de Lapertosa et al. (2021) in Argentina which stated that following an intervention of GDM education by healthcare team coordinating with primary care units significantly decreased GWG, cesarean deliveries and fetal macrosomia.

Web-based educational interventions have also been proved to be beneficial in improving knowledge and practices among antenatal women. South Korean antenatal women with GDM were engaged in a 12-week web-based education program for self-management in a study by (Kim et al., 2019) and improved self-care practices and glycated hemoglobin (HbA1c) levels were observed in the control group. Comparably, a study in Australia incorporating intervention of web-based education to improved knowledge of GDM, healthy lifestyle and diet, reported that perception towards GDM, self-care management were enhanced in the intervention group and maternal and fetal complications were also low in this group (Sayakhot et al., 2016). In addition, another study in Australia by Carolan-Olah & Sayakhot (2019) also showed that a web-based GDM educational intervention improved gestational weight loss in 90.4% of antenatal women, 44.2% women achieved a healthy weight at 12 week of gestation and a normal glycemic level was achieved by antenatal women post intervention. Similarly, a systematic review by (Leblalta et al., 2022) also found improved pregnancy outcomes and glycemic control including HbA1c, fasting and postprandial glucose levels among antenatal women with GDM after a digital health education intervention.

Health educational interventions including health education sessions, web-based and digital educational interventions on GDM have proven to be advantageous in increasing knowledge and encouraging positive attitude and healthy lifestyle practices among antenatal women. Educational interventions on GDM, glycemic control, PA and diet was proven to be essential

to impose knowledge, positive attitude and healthy practices in antenatal women to reduce the incidences of GDM.

Knowledge and attitude of antenatal women on GDM and their management of practice to prevent the risk of GDM or manage the condition has not yet been established in Maldivian population. So, it is important to develop quantitative data on KAP in the population of Maldives which can guide healthcare professionals in expanding strategies and interventions to encourage and impose positive attitude and practice in antenatal women. This study, therefore aim to investigate the level of and relationship among knowledge, attitude and practice of management of GDM amongst antenatal women visiting IGMH in the capital city of Maldives.

2.7. CONCEPTUAL FRAMEWORK

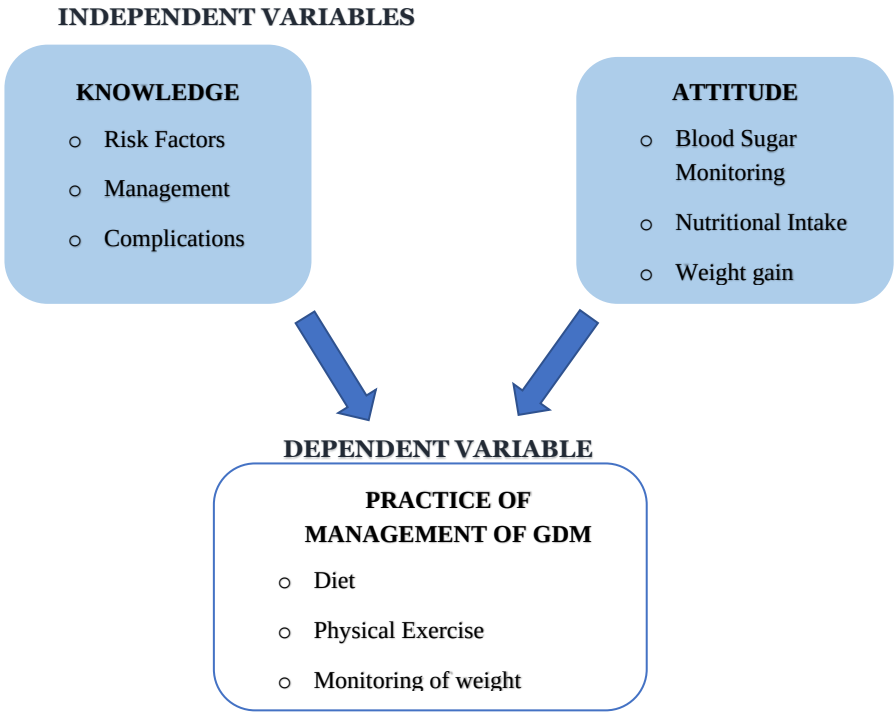

Figure 1: Conceptual framework of the study

Better understanding of disease condition and attitudes can lead to positive behavior in people. Knowledge and attitude are the motivating factors for the behavioral change, and only when individuals understand health-related knowledge and adopt a positive attitude is it feasible to establish effective behavior (Jacobsen, 2021). Above explained literature review found that antenatal women's knowledge about GDM may have an impact on their attitudes, which in turn may have an influence on the practice they use to manage the condition. The aforementioned conceptual model is designed based on the literature review to investigate their relationships. The model of KAP was utilized in this study as it is a representative approach for gathering data on what is understood, held to be true, and is being done in respect to a particular topic (Jacobsen, 2021). Dependent variable in this model is management of practice of GDM and independent variables are knowledge and attitude towards GDM. Knowledge will assess understanding of risk factors, maternal and fetal complications and management of GDM. Attitude will assess behavioral manner and self-care manner and ignorance towards blood sugar monitoring, nutritional intake, weight gain and physical exercise. Practice will assess self-care behaviors of diet, weight monitoring and physical exercise and regular antenatal check-ups. The knowledge of GDM in participants can have an effect on their practice towards management of GDM. Likewise, their attitude towards GDM can have an effect on their practice towards management of GDM.

2.8. CONCLUSION

Literature showed that there is a vast disparity in prevalence rates in different countries depending on differences in ethnicity, lifestyle, diagnostic criteria and population characteristics. Studies identify maternal age, BMI, family history of DM and previous history of GDM as the risk factors associated with GDM. Fetal macrosomia, neonatal hypoglycemia, HDP, and premature birth was identified in many studies as the fetal and maternal complications arising from GDM. Studies reported that the level of knowledge on GDM differs

among countries and ethnicities depending on age group, educational level, socio-economic status, and family history of DM. Though most studies showed poor knowledge among antenatal women, these studies found that a favorable attitude has been demonstrated by antenatal women towards GDM. Moreover, practice towards management of GDM was found to be correlated with attitude and practice. Healthy lifestyle practices including physical activity, intake of a nutritionally balanced diet and normal GWG was found to be helpful in reducing the risk for development of GDM. Moreover, educational interventions were reported to be useful in providing knowledge and awareness of GDM among antenatal women encouraging healthy lifestyle practices and reducing adverse pregnancy outcomes. Findings by literature suggest the need for development of health promotion interventions among antenatal women in every community to reduce the occurrence of GDM.

CHAPTER 3: METHODOLOGY

There are eight primary sections in this chapter. The study's design is described in the first section. The second and third sections discuss the study's sample, population, and instrument. The fourth section explains the data management and analysis procedures that was used to interpret the raw data. The pilot study is the fifth section. Sixth and seventh section comprises limitations of the study and dissemination process of the final paper. The ethical considerations are emphasized in the last section.

The methodology is the particular approaches researchers determine to apply within the constraints of the chosen design of the study. These are the specifics of the project, the essentials of inquiry process, and incorporate how setting/s of research will be chosen, who should be the subjects of the study, recruitment process of subjects and how they will be consented to, data collection process and which instruments will be used for this, how any needed intervention will be implemented, data analysis process and how the collected data will be organized (Gray & Grove, 2021).

3.1. RESEARCH DESIGN

Designing involves the researcher's approach of constructing and developing proposed research, which involves deciding on the main method of study to be undertaken, its precise subtype, and eventually the specifics of the research's actual conduct (Gray & Grove, 2021). It includes the researcher's selection of the optimal technique to address research objectives and questions, considering a variety of factors such as the sample size, population, data collecting timing, and, if applicable, researcher intervention (Gray & Grove, 2021). A cross-sectional descriptive correlational study design was adapted to perform the research. Cross-sectional design can be used to collect data from subjects in a population at a single point of time when the focus is not on the time (Gray & Grove, 2021). Research is descriptive in nature when it is

carried out in a natural setting to address study questions associated with prevalence, incidence and likelihood of occurrence of a related phenomenon (Gray & Grove, 2021). Descriptive correlational studies involve statistical analyses to demonstrate both occurrence and relationship (Gray & Grove, 2021). The principal purpose of descriptive research is to analyze the distribution of variables in a population and correlational research aims to analyze the association between those variables cross-sectional descriptive and correlational study design will be adapted to perform the research (Gray & Grove, 2021). So, the proposed design for the research is suitable to carry out the study as it aims to measure the level of GDM and KAP towards management of GDM and examine the relationship among these variables in a population of antenatal women visiting RHC in IGMH.

3.2. SETTING, SAMPLE, POPULATION OR SUBJECTS

The population for this study was antenatal women visiting for antenatal care at RHC of IGMH between 10th August 2022 to 10th September 2022. IGMH was chosen as a study setting as it is located in the most populated city of the Maldives and due to the large number of patients visiting the hospital. Antenatal women visited to RHC during the period of data collection who were willing to participate and fit to inclusion criteria was enrolled in the study.

The researcher utilized random sampling techniques to determine the study sample when the goal is to generalize the results to the overall population of interest (Gray & Grove, 2021). This involves choosing subjects from the available population using a probability method wherein researcher has no influence over which subjects are chosen (Gray & Grove, 2021). Every member of the available population has higher than zero probability of being chosen in randomization (Gray & Grove, 2021). Random sampling is a strategy which can improve external validity, or the degree to which findings can be applied to the entire population (Gray & Grove, 2021). Sampling frame included all antenatal women visiting to RHC consenting to participate

in the study and those who fit into inclusion and exclusion criteria. One in two antenatal women who fitted the recruitment criteria and gave consent for the study was recruited. The approximate sample size was calculated by considering the number of antenatal women visited to RHC during February 2022, which is 390 antenatal women according to antenatal record statistics from RHC (A. Ibrahim, personal communication, March 3, 2022). Sample size was calculated using the Yamane's Formula.

$$n = N/1 + N (e)2.$$

n = size of sample; N = population under study; e = margin error (e = 0.05 and 95% confidence level are assumed). With this (N = 390/1 + 390(0.05)2), the sample size is calculated as 197 participants.

Inclusion Criteria

- Maldivian women.
- Pregnant women visiting for antenatal care at RHC of IGMH.

Exclusion Criteria

- Pregnant women with diagnosis of Type I or Type II DM.
- Women who were not able to provide written and verbal consent.

Only Maldivian women registered in the antenatal record of RHC and visited there for antenatal care was recruited as this is a study targeted to Maldivian population. Pregnant women with diagnosis of Type I or Type II DM were excluded to reduce sample bias as there is a high probability that they already have the knowledge of DM and practice self-care for DM management. Women who were unable to provide written or verbal consent was excluded as

ethical considerations requires consent of the participants to include in the study and this group will not be able to provide answers to the questionnaire.

3.3. INSTRUMENT AND MATERIALS

An interviewer-administered pre-tested questionnaire was adapted (Appendix 2). The questionnaire was created based on a study by Md Jazli et al. (2021). The Cronbach Coefficient Alpha test was performed to determine the instrument's reliability and the majority of the questions employed a scaled item with a value of 0.714 (Md Jazli et al., 2021). The questionnaire and author's written consent to use the instrument was provided by email (Appendix 6). The instrument's content had been slightly updated and adjusted to fit the Maldivian culture and beliefs, and questions had been translated to Dhivehi. Translation of the original questionnaire was performed by a Dhivehi language expert and back translation of the Dhivehi questionnaire was performed by a Maldivian teacher who specialized in English language and have not seen the original English questionnaire. Translated questionnaire has been consulted with a language expert in Dhivehi who teaches Dhivehi in higher secondary students. The questionnaire was composed into four sections and contains 36 questions. Content validity of the translated questionnaire was sought from three midwives based on clarity, relevance and translation equivalence. For data collection, the author personally approached the participants during their visit to RHC and a verbal and written consent was taken from them. Participants' phone numbers were collected and they were contacted by the author through phone for data collection using the questionnaires. Author's phone number was also provided to each participant.

Four sections of the questionnaire include:

- Section A: Consisted 6 questions regarding demographic data including age, occupation, educational level, family history of GDM, parity, and history of GDM in previous pregnancies.
- Section B: Consisted 12 dichotomous questions regarding knowledge of GDM with yes or no as answers. This includes two questions with negative statements and rest with positive statements. Every right answer scores 1 and the maximum score for this section is 12 marks. Maximum score shows a higher knowledge regarding GDM.
- Section C: Consist 10 questions regarding attitude towards GDM with Likert scale answers of strongly agree, agree, neutral, disagree, and strongly disagree. This also included two questions with negative statements and rest with positive statements. For a question with a negative statement strongly disagree can score five points, followed by four points for disagree, three for neutral, two for agree and one for strongly agree. Conversely, the marks granted for questions with negative assertions will be the inverse of those given for questions with positive assertions. This means the maximum score for attitude will be 50 marks and minimum will be 10 marks.
- Section D: Consisted 9 questions regarding practice towards GDM prevention, featuring three answer options: never, occasionally, and frequently/always. This included three questions with negative statements and rest with positive statements. For a question with a negative statement answer with never can score three points, followed by two points for occasionally and one for frequently/always. This means the maximum score for practice will be 27 marks and minimum will be 9 marks.

3.4. DATA MANAGEMENT AND ANALYSIS

Data were transferred from questionnaires into a password protected Excel spreadsheet for the full availability and capture of the data and was only accessed by the author. SPSS (Statistical Package for the Social Sciences) 25.0 program package was utilized to analyze the data. SPSS is a software application analysis tool that is useful in generating statistical analysis when collected data are entered in it (Gray & Grove, 2021). All data was sorted, structured, and ordered per the identification code, which was tagged on each set of questionnaires to avoid double-entry. Mean, percentage distribution and standard deviation were used with demographic characteristics of age, occupation, educational level, family history of GDM, parity and history of GDM in previous pregnancies. The research questions were answered by using Pearson's correlation to predict the probability of a relationship between level of knowledge, attitude and practice. P value <0.05 was deemed statistically significant in all analyses.

When it comes to quantitative approach, rigor entails a high level of consistency, precision, and regard to all measurable components of the study (Gray & Grove, 2021). To achieve rigor, the sample size was determined giving attention to inclusion criteria and study setting was chosen to avoid any potential interference with the results. Moreover, data were recorded meticulously with a reliable software application.

3.5. PILOT STUDY

A pilot study is a smaller-scale study utilizing the same setting, population, data collection and data analysis plans as a full-scale study and aims to see if the proposed procedures are effective at finding and consenting subjects, as well as gathering useful data (Gray & Grove, 2021). Conducting a pilot study is crucial to save time and effort when the research process' final steps are executed and it may be used to discover flaws that may affect study validity or difficulties

in utilizing the instruments (Gray & Grove, 2021). A pilot test was carried out with 10 participants to check the validity and reliability of the questionnaire. Planned methods were used for data collection after obtaining the consent and participants were asked to identify questions in the questionnaire which they find confusing and unclear. Based on this feedback, questions which were unclear to participants was modified to ensure validity, feasibility and reliability of the research instrument. Phrasing of any question in the questionnaire was not changed as participants from pilot study did not report it to be unclear and confusing to them. The data obtained from pilot study were used in the data set of actual study.

3.6. ETHICAL CONSIDERATIONS

Prior to the conduct of the study, ethical approval was sought from National Health Research Council (NHRC) (Appendix 8). No objection letter to conduct the study (Appendix 7) was obtained from the National Health Academy (NHA) of IGMH and they were informed before starting the data collection. A proposal with required form and documents were submitted NHRC and to NHA sought the ethical approval.

Participation in the study was voluntary, and the participants' identities were protected. Information regarding the study were provided to all participants (Appendix 3) during the antenatal visit to RHC and written and verbal consent was obtained via consent letter (Appendix 4). The information participants contributed was treated confidentially and were only accessed by the author and supervisor. They were also notified of their right to withdraw their participation at any time, with no penalty, and that the information they provided will not be used in the study if they do so. Only the information required for the study were collected and no personal information such as name or address were gathered in the process of data collection.

Data collected from participants will be retained for one year and hard copies of data collected in questionnaires will be stored in a locked cabinet and computerized data will be stored in a secure server that is locked. After one-year hard copies will be burned and computerized data will be disposed irreversible and permanently.

CHAPTER 4: RESULTS

There are eight primary sections in this chapter in regard with study objectives. First section demonstrates findings on demographic characteristics of participants. Construct reliability of instrument used in the study is described in the second section. Results of level of knowledge, attitude and practice towards management of GDM are explained in the third, fourth and fifth sections respectively. Tests on assumptions of multiple regression are demonstrated on sixth section. Eighth section closes with the results of correlation analysis between knowledge, attitude and practice towards management of GDM among antenatal women.

Between 10th August 2022 and 10th September 2022, total of 197 antenatal women eligible for the study were selected randomly to participate in the study and their responses to the questionnaire were collected successfully. In the set 197 completed questionnaires, no missing data were occurred.

4.1 DEMOGRAPHIC FINDINGS

A total of 197 questionnaires were collected from respondents with no missing values. The main aim of this section is to understand the demographic profile of the respondents. The Table 1 below illustrates a summary of demographic descriptive.

Table 1: Distribution of respondents according to demographic variables (n=197)

DEMOGRAPHIC CHARACTERTISTICS		FREQUENCIES (F)	PERCENTAGE (%)
Age	16 - 24	36	18.3%
	25 - 34	117	59.4%
	Above 35	44	22.3%
Educational Level	No formal education	1	0.5%
	Primary education	18	9.1%
	Secondary education	96	48.7%
	Higher Education: Diploma / Degree / Master / PhD	82	41.6%
Occupation	Domestic work	108	54.8%
	Government job	57	28.9%

	Private sector	20	10.2%
	Owned business	12	6.1%
Family History of DM	Yes	103	52.3%
	No	94	47.7%
Previous History of GDM	Yes	21	10.7%
	No	172	87.3%
	Don't know	4	2.0%
Para	Nullipara	53	26.9%
	Multipara	144	73.1%

The results of this study indicated that the mean age of antenatal women was 29.9 years (SD: 5.3) and range was 16 – 41. The study results found that majority of 59.4% (n= 117) respondents were aged between 25-34 years. 18.3% (n= 36) of respondents were aged between 16 – 14 years and 22.3% (n= 44) were above 35 years of age. Figure 2 demonstrates distribution of respondents according to age groups.

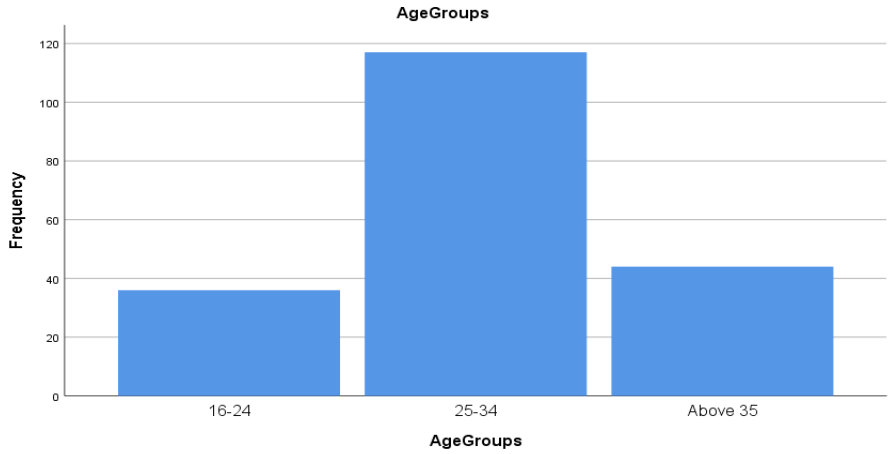

Figure 2: Distribution of respondents according to age group (n=197)

Figure 3 shows demographic distribution of 197 respondents according to their educational levels. Educational levels were grouped as no formal education, primary education, secondary education and higher education which included respondents with diploma, degree, Masters and PhD level education. Study found only 1 respondent with no formal education and 9.1% (n= 18) respondents had attained primary education. Results showed majority of 48.7% (n= 96)

and 41.6% (n= 82) respondents had attained secondary education and higher education respectively.

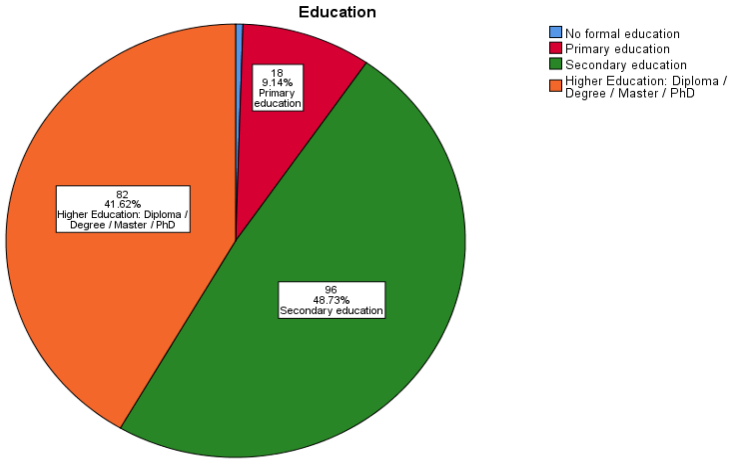

Figure 3: Distribution of respondents according to educational level (n= 197)

Figure 4 demonstrates demographic distribution of 197 respondents according to their occupation. Occupation was grouped as domestic work, government job, private sector and owned business. According to demographic results, 28.9% (n= 57) respondents were working in government jobs and respondents working in private sector contributed to 10.2% (n= 20). 6.1% (n= 12) respondents had their own business.

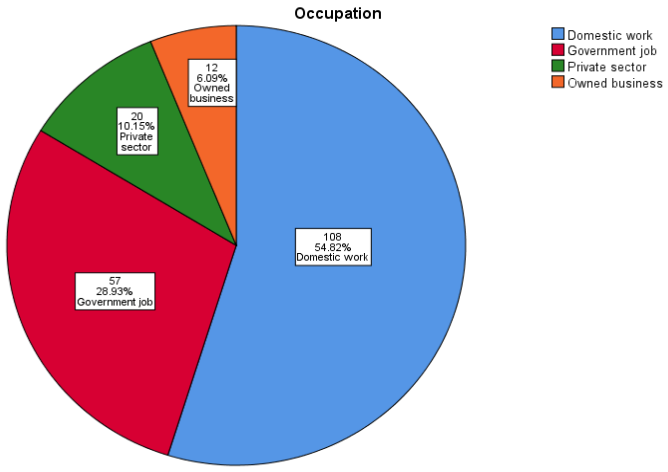

Figure 4: Distribution of respondents according to occupation (n= 197)

Figure 5 illustrates demographic distribution of 197 respondents according to their family history of DM. The findings indicated that 52.3% (n= 103) respondents had family history of DM and the rest of the respondents 47.7% (n= 94) had no family history of DM.

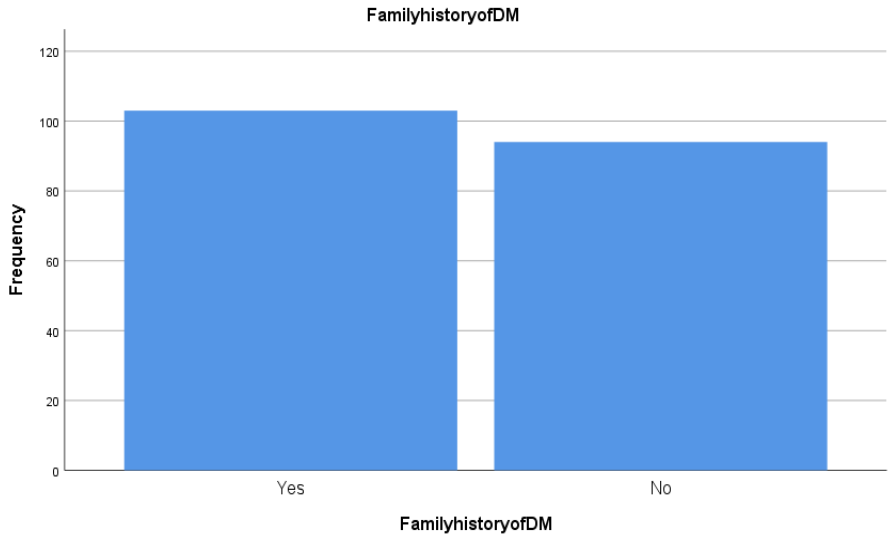

Figure 5: Distribution of respondents according to family history of DM (n= 197)

Figure 6 shows demographic distribution of respondents according to their previous history of GDM. The findings indicated majority of 87.3% (n= 172) respondents had no previous history of GDM and 10.7% (n= 21) respondents were diagnosed with GDM in their previous pregnancy. The rest of the respondents 2% (n= 4) did not know their diagnosis status of GDM in their previous pregnancies.

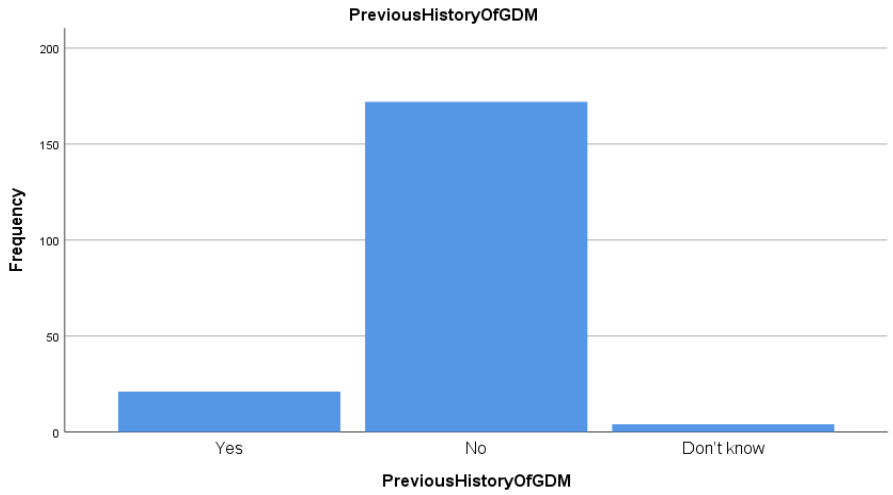

Figure 6: Distribution of respondents according to previous history of GDM (n= 197)

Figure 7 illustrates demographic distribution of 197 respondents according to their family history of DM. Parity was categorized into nullipara and multipara. According to findings majority of 73.1% (n= 144) of women were multiparous and the rest of the respondents 26.9% (n= 53) were nulliparous women.

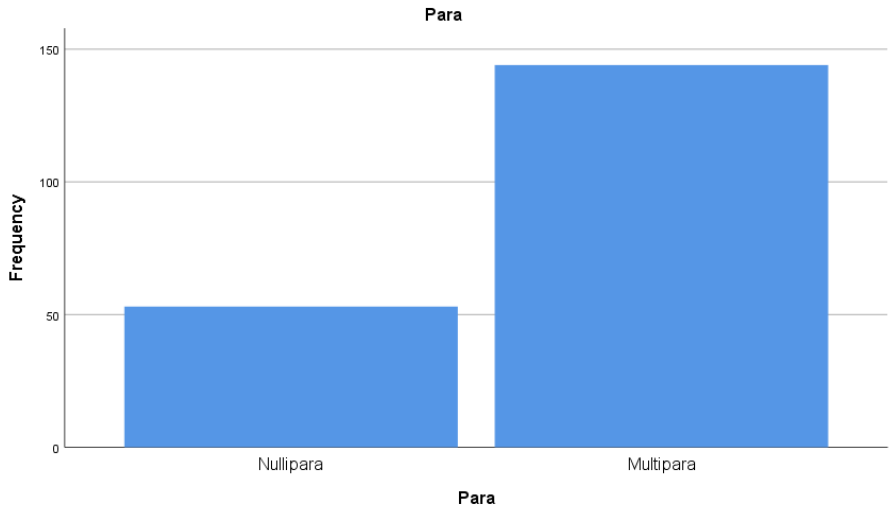

Figure 7: Distribution of respondents according to parity (n= 197)

4.2 RELIABILITY

Table 2: Reliability analysis of the constructs.

CONSTRUCTS	NUMBER OF ITEMS	CRONBACH'S ALPHA
KNOWLEDGE	12	0.85
ATTITUDE	10	0.71
PRACTICE	9	0.62

Cronbach's alpha coefficient for internal consistency was utilized in this study to calculate construct reliability and internal consistency of scale constructs of knowledge, attitude and practice towards management of GDM. It is a statistical method utilized determine internal consistency and this coefficient can range from 0.00 to 1.00, with 0.00 signifying no reliability and internal consistency and 1.00 or a value closer to this signifying robust reliability and internal consistency (Gray & Grove, 2021). According to Gray & Grove (2021), coefficient less than 0.6 signifies poor reliability and significant random error in measurement. Cronbach's alpha of three subscale constructs used in the study is demonstrated in Table 7.

Cronbach's alpha for three subscales ranged from 0.62 to 0.85. Cronbach's alpha of 12-item construct knowledge was strong with (alpha = 0.85) indicating a high reliability and 12 statements assessing knowledge towards GDM were understood in the same way by the respondents. Attitude towards management of GDM with 10 items of one-to five-point Likert-scale also demonstrated a decent Cronbach's alpha of 0.71, representing a good reliability and 10 statements assessing attitude were acknowledged similarly by the respondents. Practice towards management of GDM included 9 items with one-to three-point Likert-scale had the lowest alpha coefficient among three subscales which is 0.62. As number of items can have a significant impact on Cronbach's alpha coefficient, this somewhat low value can be considered as acceptable reliability and consistency of 9 statements.

4.3 LEVEL OF KNOWLEDGE

Mean score of respondents' knowledge regarding GDM was 6.61 (SD: 4.3) and minimum score was 0 and maximum score was 12.

Table 3: Level of knowledge of 197 respondents

LEVEL OF KNOWLEDGE	FREQUENCIES (N)	PERCENTAGE (%)
LOW	134	68 %
MODERATE	33	16.8 %
HIGH	30	15.2 %

Levels of knowledge was categorized using the same tool applied in the authors' study from which instrument was derived which is Bloom's cut-off point (60-80%). Applying this, respondents' levels of knowledge regarding GDM were categorized into three levels: low, moderate, and high. In accordance with Md Jazli et al. (2021), who cited Bloom (1956), there are three levels of KAP, with the low-level accounting for less than 60% of the total points, the moderate level ranging from 60% to 80% of the total points, and the high-level accounting for 80% to 100% of the total points. As maximum total score for knowledge questions is 12, score between 0 – 8 is categorized as low knowledge, 8 – 10 as moderate knowledge and 10 -12 as high knowledge. Table 3 and Figure 8 demonstrates level of knowledge of respondents. These findings indicate that out of 197 participants majority of 68% (n = 134) respondents had low knowledge of GDM, 16.8% (n = 33) had moderate knowledge and only 15.2% (n = 30) had high knowledge of GDM. This means a major proportion of antenatal women does not have knowledge of risk factors that can contribute to the development of GDM, its complications to maternal and fetal health and management of the condition.

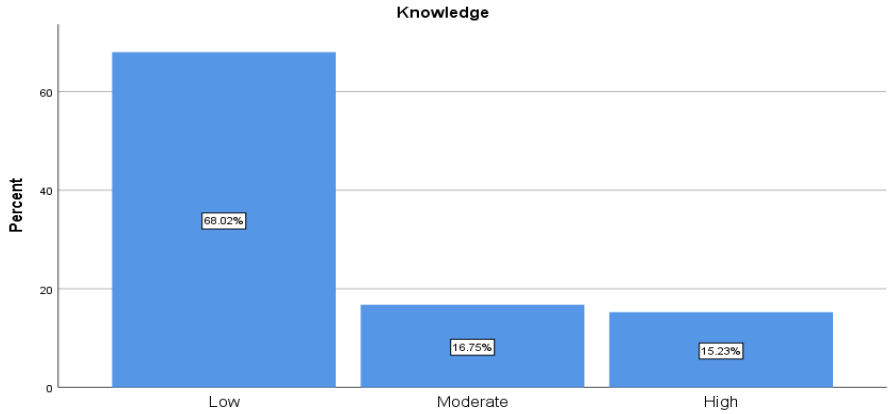

Figure 8: Level of knowledge of 197 respondents

Table 4 illustrates responses of 197 participants on knowledge statements. Findings on this shows that 54.3% (n = 107) participants are not aware that GDM occurs first time during pregnancy. However, majority of 71.6% (n = 141) of participants were aware that GDM can be controlled by taking a desirable diet or by using medications. Risk of being overweight, being pregnant at an older age and having PCOS on GDM is recognized by 40.1% (n = 79), 35% (n = 69), and 25.4% (n = 50) of participants respectively. This shows that risk factors leading to development of GDM were not known to majority of participants. However, 79.2% (n = 156) of participants had the knowledge on risk of family history of DM on GDM and 59.9% (n = 118) had the knowledge of risk of previous history of GDM on development of GDM in current pregnancy. The results also indicated that 82.7% (n = 163) of participants were aware that blood glucose should be monitored if diagnosed with GDM and 66% (n = 130) of participants are aware that blood glucose should be monitored even after pregnancy in these cases. This indicated that majority of participants were aware about the importance of blood glucose monitoring in patients with GDM. A person with GDM should not consume foods with high carbohydrates and sugar is acknowledged as a correct statement by 70.1% (n = 138) of participants. Results also showed that 57.4% (n = 113) and 56.9% (n = 112) of participants

were not aware that intrauterine fetal death and development of type 2 DM in the future as complications arise from GDM, respectively.

Table 4: Distribution of respondents according to responses of knowledge towards GDM (n= 197)

Knowledge Statements		*FREQUENCIES (n)*	*PERCENTAGE (%)*
GDM is a form of diabetes mellitus that first occurs during pregnancy	No/Don't know	107	54.3 %
	Yes	90	45.7 %
GDM can be controlled by making desirable dietary changes or by using medication and insulin.	No/Don't know	56	28.4 %
	Yes	141	71.6 %
If you have family history of diabetes, you are more likely to develop GDM.	No/Don't know	41	20.8 %
	Yes	156	79.2 %
Being overweight before pregnancy and excessive weight gain during pregnancy do not increase the risk of GDM.	Yes/Don't know	118	59.9 %
	No	79	40.1 %
Being pregnant with an older age (above 35 years of age) does not increase the risk of GDM.	Yes/Don't know	128	65.0 %
	No	69	35.0 %
The risk of GDM is increased if you have a condition of developing cyst in ovary or polycystic ovary syndrome (PCOS).	No/Don't know	147	74.6 %
	Yes	50	25.4 %
If you have had high blood sugar in a past pregnancy, you are more likely to develop GDM this time	No/Don't know	79	40.1 %
	Yes	118	59.9 %
If you are diagnosed with GDM, you will need to monitor your blood sugar levels.	No/Don't know	34	17.3 %
	Yes	163	82.7 %
If you have GDM, you should continue to monitor your blood sugar after delivery.	No/Don't know	67	34.0 %
	Yes	130	66.0 %
A person with GDM should continue to eat food consuming carbohydrates and sugar.	Yes/Don't know	59	29.9 %
	No	138	70.1 %
If you have GDM, you have an increased risk of fetal death.	No/Don't know	113	57.4 %
	Yes	84	42.6 %
If you have GDM, you have an increased risk of developing type 2 Diabetes Mellitus in the future.	No/Don't know	112	56.9 %
	Yes	85	43.1 %

Table 5: Distribution of level of knowledge according to demographic characteristics (n= 197)

DEMOGRAPHIC CHARACTERTISTICS		LEVEL OF KNOWLEDGE N (%)		
		Low	Moderate	High
Age	16-24	26 (19.4 %)	4 (12.1 %)	6 (20.0 %)
	25-34	77 (57.5 %)	21 (63.6 %)	19 (63.3 %)
	Above 35	31 (23.1 %)	8 (24.2 %)	5 (16.7 %)
Educational Level	No formal education	1 (0.7 %)	0 (0.0 %)	0 (0.0 %)
	Primary education	15 (11.2 %)	3 (9.1 %)	0 (0.0 %)
	Secondary education	81 (60.4 %)	9 (27.3 %)	6 (20.0 %)
	Higher Education: Diploma / Degree / Master / PhD	37 (27.6 %)	21 (63.6 %)	24 (80.0 %)
Occupation	Domestic work	85 (63.4 %)	14 (42.4 %)	9 (30.0 %)
	Government job	23 (17.2 %)	15 (45.5 %)	19 (63.3 %)
	Private sector	17 (12.7 %)	2 (6.1 %)	1 (3.3 %)
	Owned business	9 (6.7 %)	2 (6.1 %)	1 (3.3 %)
Family History of DM	Yes	64 (47.8 %)	22 (66.7 %)	17 (56.7 %)
	No	70 (52.2 %)	11 (33.3 %)	13 (43.3 %)
Previous History of GDM	Yes	14 (10.4 %)	3 (9.1 %)	4 (13.3 %)
	No	118 (88.1 %)	30 (90.9 %)	24 (80.0 %)
	Don't know	2 (1.5 %)	0 (0.0 %)	2 (6.7 %)
Para	Nullipara	34 (25.4 %)	7 (21.2 %)	12 (40.0 %)
	Multipara	134 (74.6 %)	33 (78.8 %)	30 (60.0 %)

Note: percentages are presented within knowledge levels.

Presented in Table 5 are level of knowledge for demographic characteristics. According to study results, age group of 18.3% (n= 36) antenatal women were 16-24 years; knowledge level was low in majority of 72.2% (n= 26) respondents in this group. Results also indicated that age between 25-34 years of antenatal women was 59.4% (n= 117) and knowledge level was also low in majority of 65.8% (n= 77) respondents in this group. Moreover, age group of 22.3% (n= 44) antenatal women were above 35 years; knowledge level was low in 70.5% (n= 31)

respondents in this group. So, these results indicated that respondents aged between 16-24 had the lowest knowledge scores.

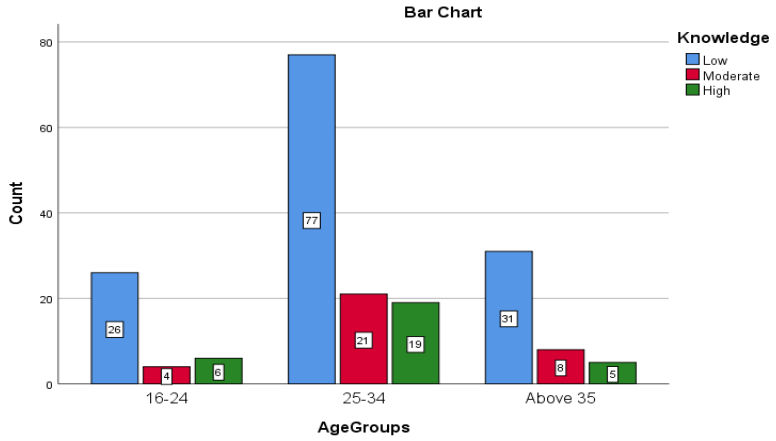

Figure 9: Distribution of level of knowledge according to age groups (n= 197)

Knowledge was overall lower in every category of education. However, results indicated that educational level of 41.6% (n= 82) antenatal women were higher education and knowledge level was significantly 52.4% higher than antenatal women with low knowledge among this group. According to study findings, antenatal women with primary education (9.1%, n= 18) and secondary education (48.7%, n= 96) had respectively and significantly 11.2% and 40.4% lower knowledge than antenatal women with high knowledge among these groups.

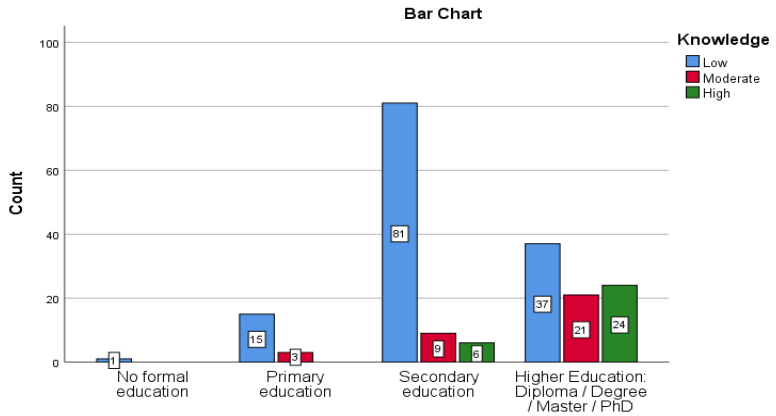

Figure 10: Distribution of level of knowledge according to educational levels (n= 197)

Knowledge was overall lower in every category of occupation. Results showed that 54.8% (n= 108) of antenatal women in this study were domestic workers or housewives and their knowledge level was observed as 33.4% significantly lower than antenatal women with high knowledge among this group. Knowledge level of antenatal women working in private sector (10.2%, n= 20) and owned business (6.1%, n= 12) was also respectively and significantly 9.4% and 3.4% lower than antenatal women with high knowledge among these groups. However, results indicated that knowledge level of antenatal women working in government jobs (28.9%, n= 57) was significantly 46.1% higher than antenatal women with low knowledge among this group. This showed that knowledge scores were mostly higher in women with secondary education.

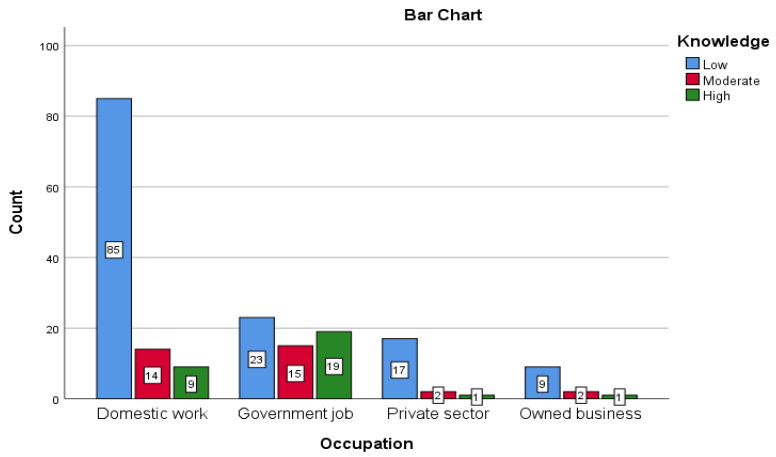

Figure 11: Distribution of level of knowledge according to occupation (n= 197)

Family history of GDM was reported by 52.3% (n= 103) antenatal women; knowledge level was 18.9% moderate and 8.9% higher than antenatal women with low knowledge among this group. No family history of GDM was reported by 47.7% (n= 94) and knowledge level was 8.9% lower than antenatal women with high knowledge in this group. However, 62.1% (n= 64) antenatal women with and 74.5% (n= 70) antenatal women without family history DM had low

knowledge. This means that knowledge scores were mostly lower in women with no family history of DM.

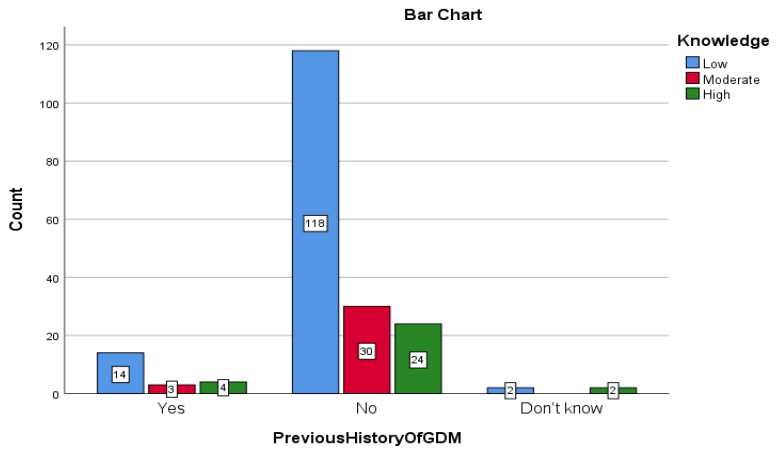

Figure 12: Distribution of level of knowledge according to family history of DM (n= 197)

Previous history of GDM was reported by 10.7% (n= 21) and no previous history of GDM was reported by majority of 87.3% (n= 172) antenatal women. Among these groups; knowledge level was 2.9% higher than antenatal women with low knowledge in respondents with previous history of GDM and 10.9% moderate and 8.1% lower in respondents with no previous history of GDM. However, results found 66.7% (n= 14) antenatal women with and 68.6% (n= 118) antenatal women without previous history GDM had low knowledge.

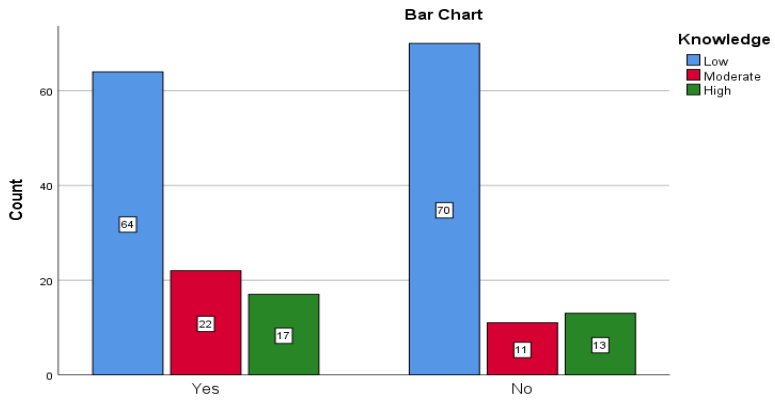

Figure 13: Distribution of level of knowledge according to previous history of GDM (n= 197)

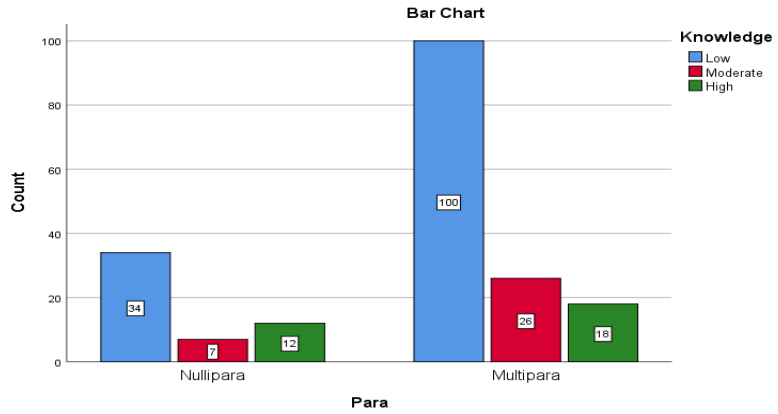

Figure 14: Distribution of level of knowledge according to parity (n= 197)

According to study results, 26.9% (n= 53) women were nulliparous and significantly 14.6% higher knowledge than antenatal women with low knowledge was observed among this group. However, in multiparous women in this study (73.1%, n=144), 14.6% significantly lower knowledge was observed than antenatal women with high knowledge was observed among this group. However, 64.2% (n= 34) nulliparous women and 69.4% (n= 100) multiparous antenatal women had low knowledge. This indicated that knowledge scores were higher in multiparous women.

4.4 LEVEL OF ATTITUDE

Table 6: Level of attitude of 197 participants

LEVEL OF ATTITUDE	FREQUENCIES (N)	PERCENTAGE (%)
LOW	7	3.6 %
MODERATE	158	80.2 %
HIGH	32	16.2 %

As same as knowledge, levels of attitude are categorized using Bloom's cut-off point (60-80%). With this, respondents' levels of attitude towards management of GDM were categorized into three levels: low, moderate, and high. As minimum total score for attitude questions is 10 and maximum total score is 50, score between 10 – 33 is categorized as low attitude, 34 – 42 as moderate attitude and 43 – 50 as high attitude. Table 6 and Figure 15 represents level of attitude of respondents. These findings show that out of 197 respondents,

majority of 80.2% (n= 158) respondents have moderate attitude towards management of GDM, 16.2% (n = 32) respondents have high attitude and only 3.6% (n= 7) respondents have low attitude towards management of GDM. These results demonstrated that majority of antenatal women had moderate attitude towards weight gain, diet and physical exercise during pregnancy to prevent GDM.

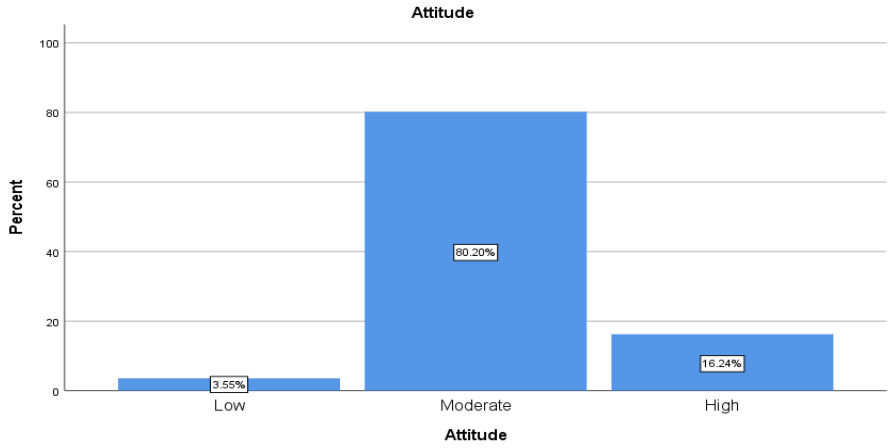

Figure 15: Level of attitude of 197 participants

Table 7 presents responses of 197 participants on attitude statements. 85.3% (n= 168) has good attitude about frequent testing of blood sugar and 85.8% (n= 169) has high attitude about normal weight gain during pregnancy. In respect with consumption of sugar, consumption of less salty and oily foods and consumption of milk; respectively 93.9% (n= 185), 87.3% (n= 172) and 82.3% (n= 162) antenatal women has high attitude. However, 54.3% (n= 107) antenatal women had low attitude about consumption carbohydrate containing foods. In regard with prevention of excessive weight gain with exercise and performing 20-30 minutes exercise; respectively 87.8% (n= 173) and 77.7% (n= 153) antenatal women has high attitude. Results also showed that 66.5% (n= 131) antenatal women has high attitude about having two years of interval between pregnancies. A novel finding according to these results is that a good nutritional intake and physical exercise was perceived to be a good practice by majority of antenatal women.

Table 7: Distribution of respondents according to responses of attitude towards GDM (n= 197)

Attitude Statements		*FREQUENCIES (n)*	*PERCENTAGE (%)*
Blood sugar levels should be tested frequently.	Strongly Disagree	1	0.5%
	Disagree	12	6.1%
	Neutral	16	8.1%
	Agree	131	66.5%
	Strongly Agree	37	18.8%
During pregnancy, weight should be controlled in a normal range.	Strongly Disagree	1	0.5%
	Disagree	10	5.1%
	Neutral	17	8.6%
	Agree	123	62.4%
	Strongly Agree	46	23.4%
Excessive consumption of sugar should be avoided.	Strongly Disagree	0	0.0%
	Disagree	4	2.0%
	Neutral	8	4.1%
	Agree	127	64.5%
	Strongly Agree	58	29.4%
You can consume as many carbohydrate containing foods as you want.	Strongly Disagree	15	7.6%
	Disagree	91	46.2%
	Neutral	33	16.8%
	Agree	54	27.4%
	Strongly Agree	4	2.0%
Amount of salt and oil in your daily diet should be reduced.	Strongly Disagree	1	0.5%
	Disagree	8	4.1%
	Neutral	16	8.1%
	Agree	127	64.5%
	Strongly Agree	45	22.8%
Exercise during pregnancy can help prevent excessive weight gain during pregnancy.	Strongly Disagree	1	0.5%
	Disagree	5	2.5%
	Neutral	18	9.1%
	Agree	136	69.0%
	Strongly Agree	37	18.8%
During pregnancy, at least 20-30 minutes exercise should be done per day.	Strongly Disagree	0	0.0%
	Disagree	8	4.1%
	Neutral	36	18.3%
	Agree	131	66.5%
	Strongly Agree	22	11.2%
You should drink fresh milk daily.	Strongly Disagree	1	0.5%
	Disagree	8	4.1%
	Neutral	26	13.2%
	Agree	126	64.0%
	Strongly Agree	36	18.3%
Baby's kick count should be checked every day.	Strongly Disagree	0	0.0%
	Disagree	6	3.0%
	Neutral	8	4.1%
	Agree	121	61.4%
	Strongly Agree	62	31.5%
I think I should give at least 2 years between next pregnancy.	Strongly Disagree	3	1.5%
	Disagree	16	8.1%
	Neutral	47	23.9%
	Agree	88	44.7%
	Strongly Agree	43	21.8%

Table 8: Distribution of level of attitude according to demographic characteristics (n= 197)

DEMOGRAPHIC CHARACTERTISTICS		LEVEL OF ATTITUDE N (%)		
		Low	Moderate	High
Age	16-24	4 (57.1%)	30 (19.0%)	2 (6.3%)
	25-34	0 (0.0%)	96 (60.8%)	21 (65.6%)
	Above 35	3 (42.9%)	32 (20.3%)	9 (28.1%)
Educational Level	No formal education	0 (0.0%)	1 (0.6%)	0 (0.0%)
	Primary education	1 (14.3%)	17 (10.8%)	0 (0.0%)
	Secondary education	1 (14.3%)	83 (52.5%)	12 (37.5%)
	Higher Education: Diploma / Degree / Master / PhD	5 (71.4%)	57 (36.1%)	20 (62.5%)
Occupation	Domestic work	3 (42.9%)	89 (56.3%)	16 (50.0%)
	Government job	0 (0.0%)	44 (27.8%)	13 (40.6%)
	Private sector	2 (28.6%)	15 (9.5%)	3 (9.4%)
	Owned business	2 (28.6%)	10 (6.3%)	0 (0.0%)
Family History of DM	Yes	4 (57.1%)	81 (51.3%)	18 (56.3%)
	No	3 (42.9%)	77 (48.7%)	14 (43.8%)
Previous History of GDM	Yes	0 (0.0%)	18 (11.4%)	3 (9.4%)
	No	6 (85.7%)	137 (86.7%)	29 (90.6%)
	Don't know	1 (14.3%)	3 (1.9%)	0 (0.0%)
Para	Nullipara	4 (57.1%)	40 (25.3%)	9 (28.1%)
	Multipara	3 (42.9%)	118 (4.7%)	23 (71.9%)

Note: percentages are presented within attitude levels.

Attitude was overall moderate in every category of age groups. Demonstrated in Table 8 are level of attitude for demographic characteristics and Figure 16 presents attitude levels for age groups. Age group of 18.3% (n= 36) antenatal women were 16-24 years; attitude was 50.8% significantly lower than antenatal women with high attitude among this group. Age between 25-34 years of antenatal women was 59.4% (n= 117) and attitude was 4.8% higher than antenatal women with moderate attitude among this group. Age group of 22.3% (n= 44) antenatal women were above 35 years; attitude was 14.8% lower than antenatal women with

high attitude among this group. This showed that attitude scores were mostly lower in antenatal women between aged 16-24 years.

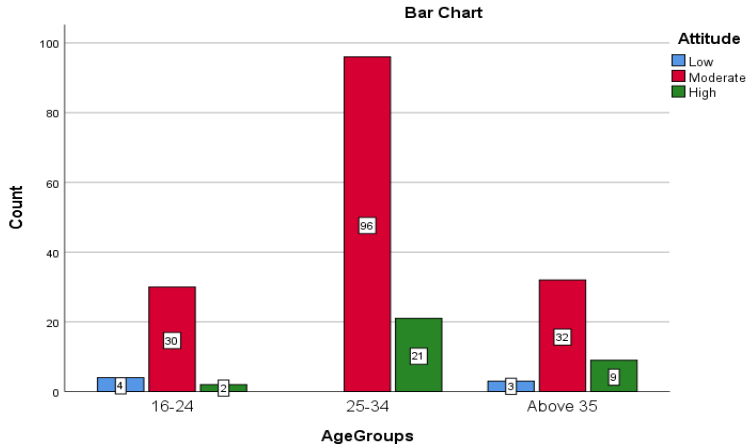

Figure 16: Distribution of level of attitude according to age groups (n= 197)

Figure 17 presents attitude levels for education. According to results, educational level of 41.6% (n= 82) antenatal women were higher education and knowledge level was significantly 26.4% higher than antenatal women with moderate attitude among this group. Results also indicated that antenatal women with secondary education (48.7%, n= 96) had significantly 23.3% higher attitude than antenatal women with low attitude among these groups.

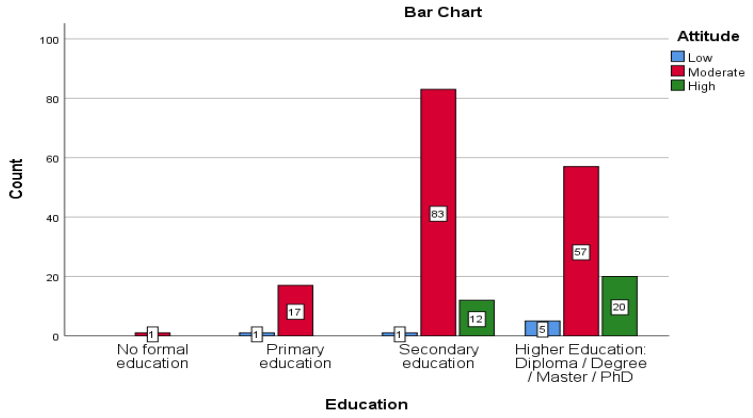

Figure 17: Distribution of level of attitude according to educational levels (n= 197)

Presented in Figure 18 are attitude levels for occupation. Attitude was overall moderate in every category of occupation. 54.8% (n= 108) of antenatal women in this study were domestic workers or housewives and their attitude level was observed as 6.3% significantly moderate than antenatal women with high attitude among this group. Attitude level of antenatal women working in private sector (10.2%, n= 20) and owned business (6.1%, n= 12) was also respectively and significantly 19.2% and 28.6% lower than antenatal women with high attitude among these groups. However, attitude level of antenatal women working in government jobs (28.9%, n= 57) was significantly 12.8% higher than antenatal women with moderate attitude 40.6% higher than antenatal women with low attitude among this group. These results indicated that attitude scores were mostly higher in women with government jobs.

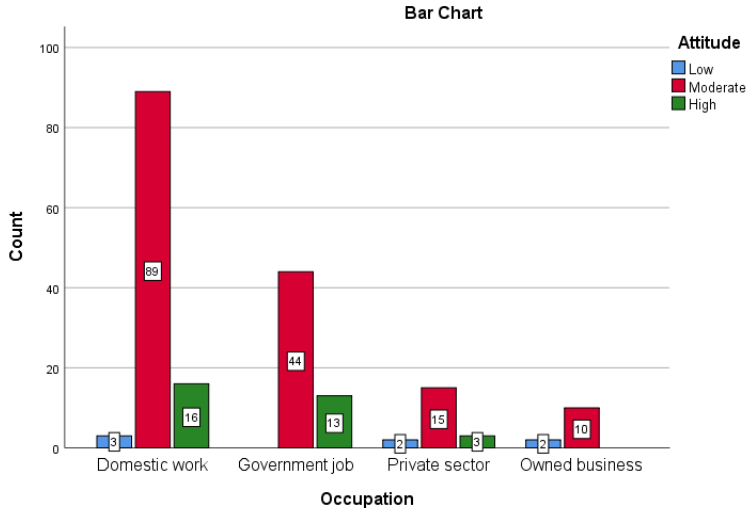

Figure 18: Distribution of level of attitude according to occupation (n= 197)

Figure 19 shows attitude levels for family history of DM. Results showed that family history of GDM was reported by 52.3% (n= 103) antenatal women; attitude level 5% higher than antenatal women with moderate attitude among this group. According to study results, no family history of GDM was reported by 47.7% (n= 94) and attitude level was 4.9% moderate than antenatal women with high attitude in this group. It also found that 78.6% (n= 81)

antenatal women with and 81.9% (n= 77) antenatal women without family history DM had moderate attitude.

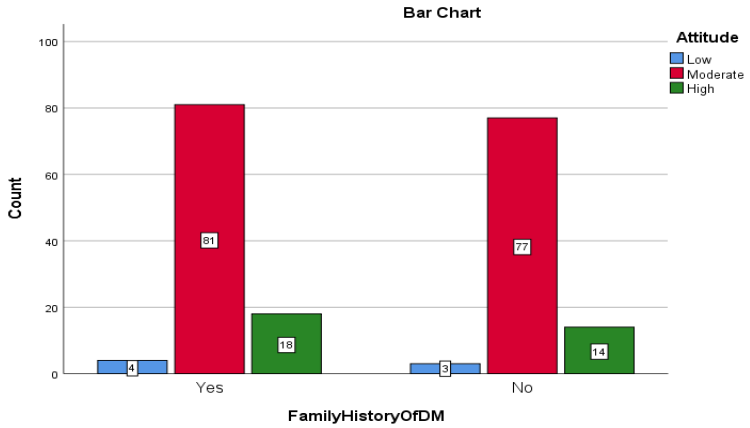

Figure 19: Distribution of level of attitude according to family history of DM (n= 197)

Figure 20 illustrates attitude levels for previous history of GDM. Results showed that previous history of GDM was reported by 10.7% (n= 21) and no previous history of GDM was reported by majority of 87.3% (n= 172) antenatal women. Among these groups; attitude level was respectively 9.4% and 4.9% higher than antenatal women with low attitude. However, 85.7% (n= 18) antenatal women with and 79.7% (n= 137) antenatal women without previous history GDM had moderate attitude, according to study findings.

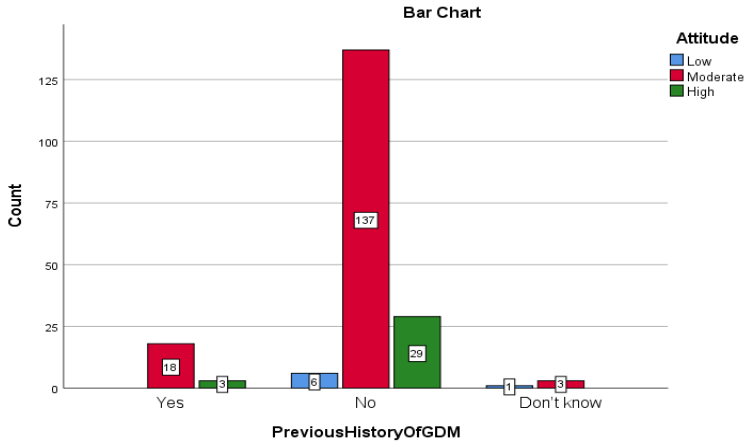

Figure 20: Distribution of level of attitude according to previous history of GDM (n= 197)

Figure 21 presents attitude levels for parity. According to study findings 26.9% (n= 53) women were nulliparous and significantly 29% lower attitude than antenatal women with low attitude was observed among this group. However, in multiparous women in this study (73.1%, n=144), 29% significantly higher attitude was observed than antenatal women with low attitude among this group. However, 75.5% (n= 40) nulliparous women and 81.9% (n= 118) multiparous antenatal women had moderate attitude as indicated by study results.

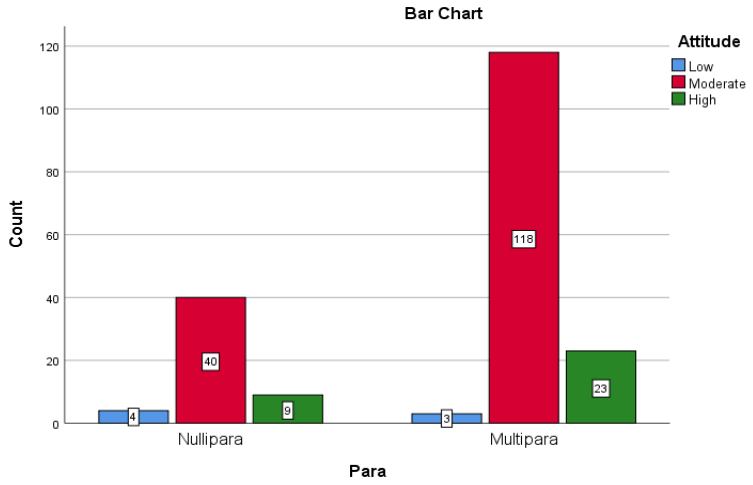

Figure 21: Distribution of level of attitude according to parity (n= 197)

4.5 LEVEL OF PRACTICE OF MANAGEMENT OF GDM

Table 9: Level of practice of 197 participants

LEVEL OF PRACTICE OF MANAGEMENT OF GDM	FREQUENCIES (N)	PERCENTAGE (%)
POOR	118	59.9 %
MODERATE	77	39.1 %
GOOD	2	1.0 %

As same as knowledge and attitude, levels of practice towards management of GDM are categorized using Bloom's cut-off point (60-80%). With this, respondents' levels of practice towards management of GDM were categorized into three levels: poor, moderate, and high. As minimum total score for practice questions was 9 and maximum total score is 27, score between 9 – 20 is categorized as poor

practice, 21 – 24 as moderate practice and 25 – 27 as good practice. Table 9 and Figure 22 represents level of attitude of respondents. These findings show that out of 197 respondents, majority of 59.9% (n= 118) respondents have poor practice towards management of GDM, 39.1% (n = 77) respondents have moderate practice and only 1.0% (n= 2) respondents have good practice towards management of GDM. From these results it evidence that only a tiny fraction of antenatal women performs healthy lifestyle practices to manage and prevent from

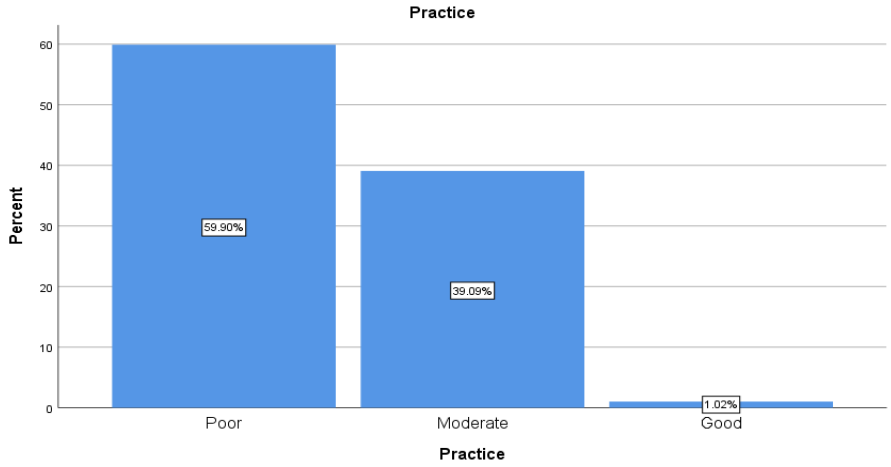

Figure 22: Level of practice of management of GDM for 197 participants

GDM.

Showed in Table 10 are data of responses of 197 participants on practice questions. 43.1% (n= 85) and are always careful about their sugar levels. In regard with consumption of carbonated drinks; 49.7% (n= 98) never consumes them during pregnancy, however 47.2 (n= 93) consumes them sometimes during pregnancy. 15.7% (n= 31) consumes sugary foods a lot and 13.2% (n= 26) eats late at night always. Majority of 79.2% (n= 156) antenatal women eats sugary foods sometimes and 74.1% (n= 146) antenatal women eats late at night sometimes. Majority of 61.9% (n= 122) antenatal women do not check their daily calorie intake and 44.2% (n= 87) antenatal women do not perform 20 – 30 minutes of exercise daily. This means a larger proportion of antenatal women does not take a healthy diet and does not engage in daily

physical exercise in order to prevent from development of GDM. However, 44.2% (n= 87) antenatal women also performs daily 20 – 30 minutes of exercise and 60.4% (n= 119) antenatal women always check their weight gain. Moreover, 67% (n= 132) antenatal women always check their baby's kick count and 95.9% (189) always do their regular pregnancy check-ups. These results conclude that antenatal women's practice was generally poor regarding nutritional intake and PA. Though results also suggests that practice regarding weight monitoring, checking fetal kick counts and visiting antenatal check-ups were good.

Table 10: Distribution of respondents according to responses of practice towards management of GDM (n= 197)

Practice Questions		***FREQUENCIES (n)***	***PERCENTAGE (%)***
Are you careful about your blood sugar levels?	Never	26	13.2%
	Sometimes	86	43.7%
	Always	85	43.1%
Do you consume carbonated or fizzy drinks?	Never	98	49.7%
	Sometimes	93	47.2%
	Always	6	3.0%
Do you consume sugar or sugary foods?	Never	10	5.1%
	Sometimes	156	79.2%
	Always	31	15.7%
Do you eat late at night?	Never	25	12.7%
	Sometimes	146	74.1%
	Always	26	13.2%
Do you check your daily caloric intake?	Never	122	61.9%
	Sometimes	69	35.0%
	Always	6	3.0%
Do you exercise for at least 20 to 30 minutes every day?	Never	87	44.2%
	Sometimes	87	44.2%
	Always	23	11.7%
Do you check the baby's kick count every day?	Never	17	8.6%
	Sometimes	48	24.4%
	Always	132	67.0%
Do you check how much weight you gain?	Never	10	5.1%
	Sometimes	68	34.5%
	Always	119	60.4%
Do you have regular pregnancy check-ups and see your doctor as directed?	Never	1	0.5%
	Sometimes	7	3.6%
	Always	189	95.9%

Table 11: Distribution of level of practice of management of GDM according to demographic characteristics (n= 197)

DEMOGRAPHIC CHARACTERTISTICS		LEVEL OF PRACTICE N (%)		
		Poor	Moderate	Good
Age	16-24	17 (14.4%)	19 (24.7%)	0 (0.0%)
	25-34	74 (62.7%)	41 (53.2%)	2 (100.0%)
	Above 35	27 (22.9%)	17 (22.1%)	0 (0.0%)
Educational Level	No formal education	1 (0.8%)	0 (0.0%)	0 (0.0%)
	Primary education	11 (9.3%)	7 (9.1%)	0 (0.0%)
	Secondary education	62 (52.5%)	33 (42.9%)	1 (50.0%)
	Higher Education: Diploma / Degree / Master / PhD	44 (37.3%)	37 (48.1%)	1 (50.0%)
Occupation	Domestic work	63 (53.4%)	44 (57.1%)	1 (50.0%)
	Government job	33 (28.0%)	23 (29.9%)	1 (50.0%)
	Private sector	15 (12.7%)	5 (6.5%)	0 (0.0%)
	Owned business	7 (5.9%)	5 (6.5%)	0 (0.0%)
Family History of DM	Yes	61 (51.7%)	41 (53.2%)	1 (50.0%)
	No	57 (48.3%)	36 (46.8%)	1 (50.0%)
Previous History of GDM	Yes	11 (9.3%)	9 (11.7%)	1 (50.0%)
	No	105 (89.0%)	66 (85.7%)	1 (50.0%)
	Don't know	2 (1.7%)	2 (2.6%)	0 (0.0%)
Para	Nullipara	26 (22.0%)	27 (35.1%)	0 (0.0%)
	Multipara	92 (78.0%)	50 (64.9%)	2 (100.0%)

Note: percentages are presented within practice levels.

Practice towards management of GDM was overall poor in every category of age groups. Presented in Table 11 are level of practice towards management of GDM for demographic characteristics and Figure 23 illustrates practice levels towards management of GDM for age groups. Age group of 18.3% (n= 36) antenatal women were 16-24 years; practice towards management of GDM was 10.3% moderate than antenatal women with poor practice among this group. Age between 25-34 years of antenatal women was 59.4% (n= 117) and practice

towards management of GDM was 37.3% higher in respondents with good practice than respondents with poor practice among this group.

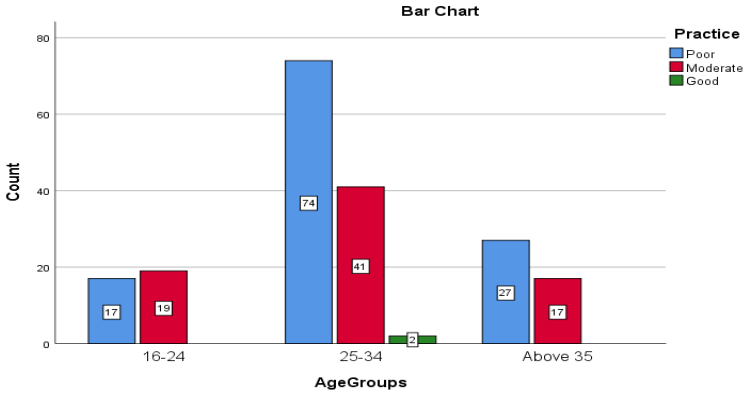

Figure 23: Distribution of level of towards management of GDM according to age groups (n= 197)

Figure 24 shows practice levels towards management of GDM for education. Findings suggests that educational level of 41.6% (n= 82) antenatal women were higher education and practice level towards management of GDM was significantly 26.4% higher in respondents with good practice than respondents with moderate attitude among this group. It also indicates that antenatal women with primary education (9.1%, n= 18) and secondary education (48.7%, n= 96) had respectively and significantly 9.3% and 2.5% poor practice towards management of GDM than antenatal women with good practice among these groups.

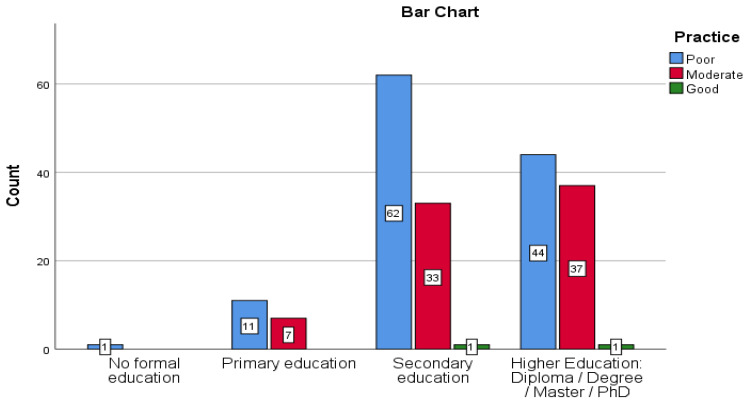

Figure 24: Distribution of level of practice towards management of GDM according to educational levels (n= 197)

Demonstrated in Figure 25 are practice levels towards management of GDM for occupation. Practice towards management of GDM was overall poor in every category of occupation. According to results, 54.8% (n= 108) of antenatal women in this study were domestic workers or housewives and their practice level towards management of GDM was observed as 7.1% moderate and 3.4% poor than antenatal women with good practice among this group. Practice level of antenatal women working in private sector (10.2%, n= 20) was also significantly 6.2% poor than antenatal women with moderate practice among this group. However, findings indicate that practice level of antenatal women working in government jobs (28.9%, n= 57) was significantly 22% higher than antenatal women with low practice among this group.

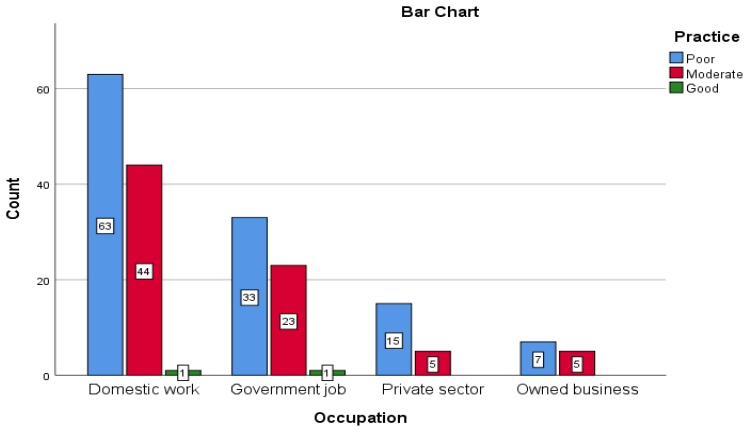

Figure 25: Distribution of level of practice towards management of GDM according to occupation (n= 197)

Figure 26 presents practice levels towards management of GDM for family history of DM. Family history of GDM was reported by 52.3% (n= 103) antenatal women; practice level was 3.2% moderate and 1.7% poor than antenatal women with good practice among this group. According to these results, no family history of GDM was reported by 47.7% (n= 94) and practice level was 1.7% higher in respondents with good practice than respondents with poor practice in this group. Results also showed that 59.2% (n= 61) antenatal women with and 60.6% (n= 57) antenatal women without family history DM had poor practice.

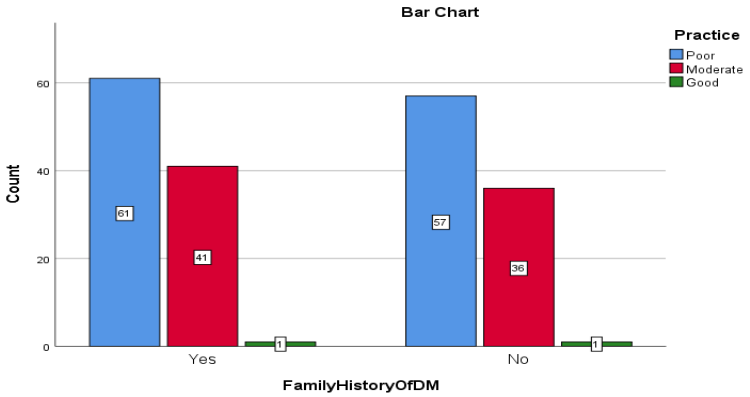

Figure 27: Distribution of level of practice towards management of GDM according to family history of DM (n= 197)

Figure 27 shows practice levels towards management of GDM for previous history of GDM. Previous history of GDM was reported by 10.7% (n= 21) and no previous history of GDM was reported by majority of 87.3% (n= 172) antenatal women. These findings showed that, among these groups; practice was 40.7% higher than antenatal women with poor practice in antenatal women with previous history of GDM. Moreover, practice was 39% poor than antenatal women with good practice in antenatal women with no previous history of GDM. However, results suggests that 52.4% (n= 11) antenatal women with and 61.0% (n= 105) antenatal women without previous history GDM had poor practice.

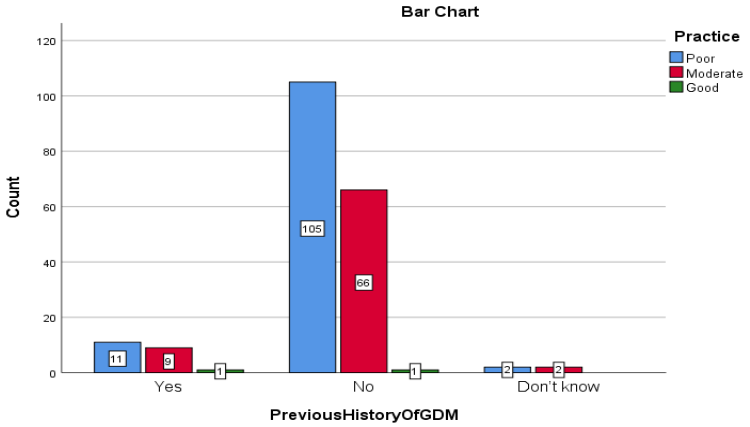

Figure 26: Distribution of level of practice towards management of GDM according to previous history of GDM (n= 197)

Figure 28 illustrates practice levels towards management of GDM for parity. Results found that 26.9% (n= 53) women were nulliparous and significantly 22% poor practice than antenatal women with good practice was observed among this group. In multiparous women in this study (73.1%, n=144), 22% significantly higher practice was observed in respondents with good practice than antenatal women with poor practice among this group. However, 50.9% (n= 27) nulliparous women had moderate practice 49.1% (n= 26) had poor practice. In multiparous antenatal women 63.9% (n= 92) had poor practice.

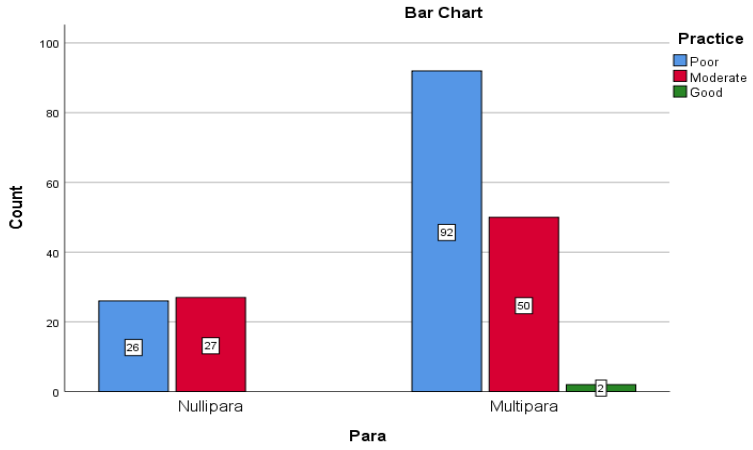

Figure 28: Distribution of level of practice according to parity (n=197)

4.6 ASSUMPTIONS OF MULTIPLE REGRESSION

Before continuing with the regression analysis, assumptions of homoscedasticity, linearity, normality and multicollinearity should be checked for any violations in these assumptions.

4.5.1 Assumption of homoscedasticity

When data are homoscedastic, they are symmetrically distributed above and below the regression line across the entire range of values, which on a scatterplot suggests a linear connection and shows that both variables have a same variance (Gray & Grove, 2021). By visually inspecting a scatterplot of the standardized residuals (the errors) by the regression standardized predicted value, the homoscedasticity assumption can be verified (Gray & Grove,

2021). Scatterplot of Figure 29 shows that the data is heteroscedastic as the residuals plotted are not random, so the assumption of homoscedasticity was violated.

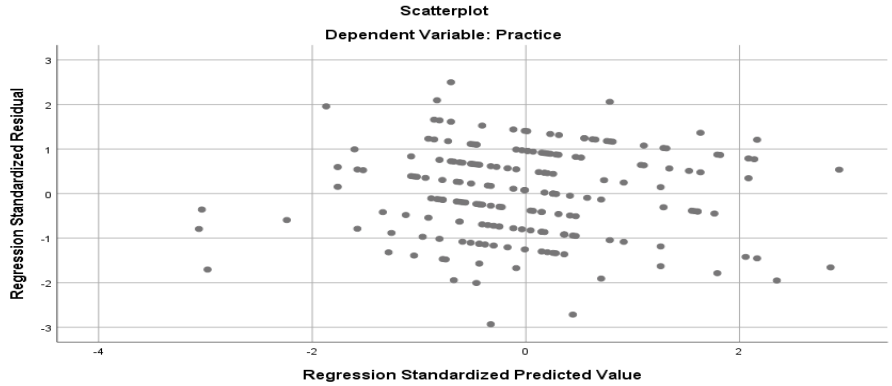

Figure 29: Scatterplot of the standardized residuals

4.5.2 Assumption of linearity

When the data are linear, they are randomly distributed above without any curve across the entire range of values, which on a scatterplot suggests a linear connection (Gray & Grove, 2021). Figure 30 and Figure 31 illustrates the partial regression plots between the dependent (practice towards management of GDM) and each independent variable (knowledge and attitude respectively) which shows that there are issues of linearity with the attitude variable. Therefore, this assumption was also violated.

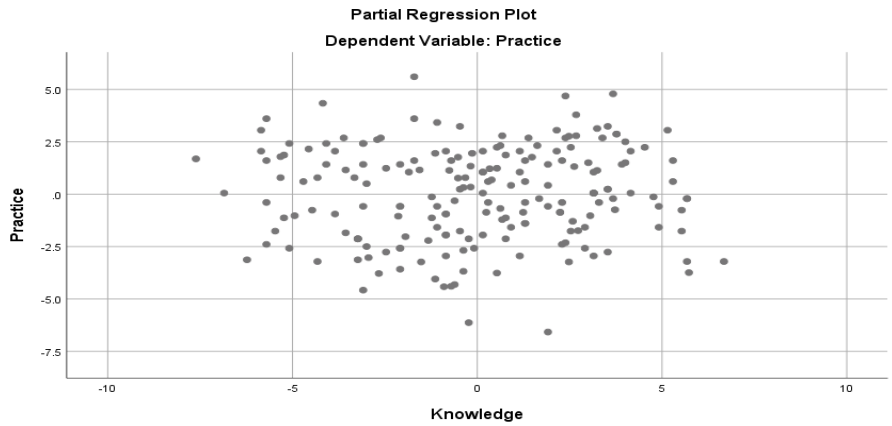

Figure 30: Partial regression plot between practice and knowledge towards management of GDM

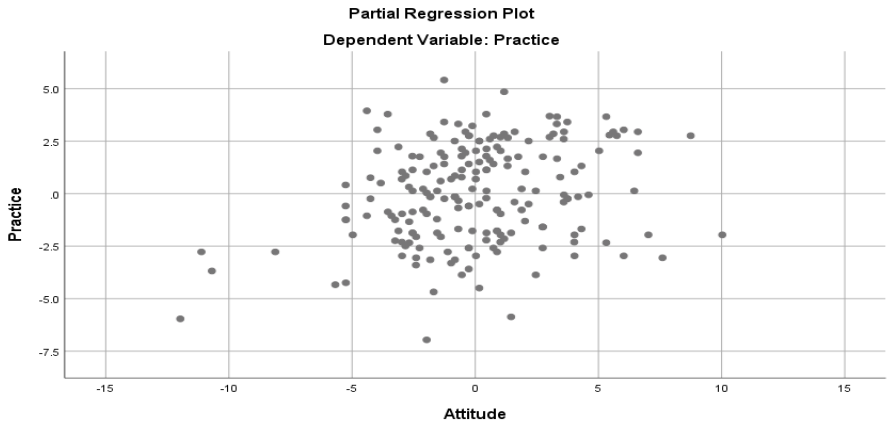

Figure 31: Partial regression plot between practice and attitude towards management of GDM

4.5.3 Assumption of Normality of errors (no outlier)

To check the normality outliers and leverage observations can be examined. If residuals that does not fit between 3.00 and -3.00 are found, that means residuals are not normally distributed and these residuals are outliers that does not fit the overall model (Frost, 2021). Figure 32 and Table 12 shows residual distribution and statistics which shows a higher leverage value greater than 2.00 which means an unusual value for independent variables and therefore, an outlier. This suggests that assumption of normality is violated.

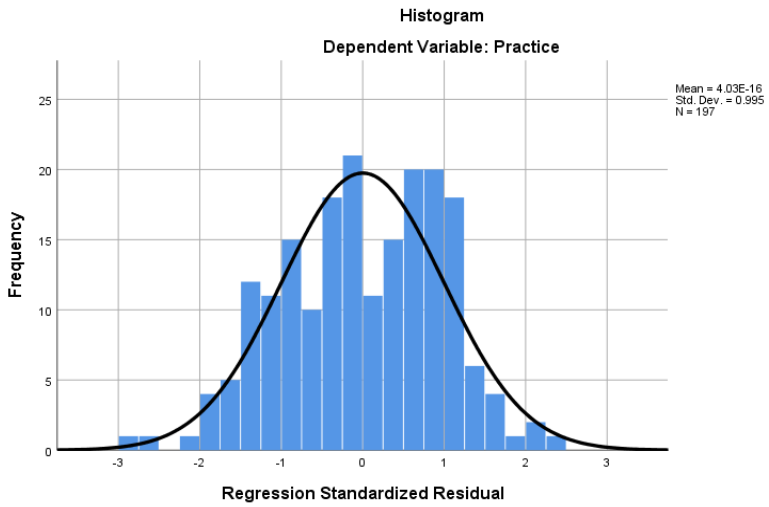

Figure 32: Histogram of regression standard residual

Table 12: Residual Statistics

	MINIMUM	MAXIMUM
Standard Residual	-2.933	2.500
Centered Leverage Value	.000	.068

Note: Dependent Variable: Practice towards management of GDM

4.5.4 Assumption of multicollinearity

High correlation between independent variables in an equation for multiple regression results in multicollinearity. Examining the correlations between the independent variables by performing a correlation analysis can examine multicollinearity. A multicollinearity issue is indicated by a tolerance of less than 0.20 and/or a variance inflation factor (VIF) of 10 and above (Gray & Grove, 2021). Table 13 of correlation coefficients demonstrates that there is no issue in multicollinearity.

Table 13: Correlation coefficients of independent variables

INDEPENDENT VARIABLES	COLINEARITY STATISTICS	
	Tolerance	VIF
Knowledge	.837	1.195
Attitude	.837	1.195

Note: Dependent Variable: Practice towards management of GDM

4.7 CORRELATION ANALYSIS

Since most of the assumptions of multiple regression are violated, the most appropriate method to test the hypotheses of this study was considered as Pearson's correlation. In Pearson product correlation, the letter *r* stands in for this coefficient (statistic), and its value is always in the range of -1.00 and +1.00 (Gray & Grove, 2021). A value of zero demonstrates no correlation between the two variables (Gray & Grove, 2021). The strengths of positive and negative associations are illustrated in Table 14 (Gray & Grove, 2021). The analysis of correlation among knowledge, attitude and practice towards management of GDM is presented in Table 15.

Table 14: Pearson r's strength of association

STRENGTH OF ASSOCIATION	POSITIVE ASSOCIATION	NEGATIVE ASSOCIATION
WEAK	0.00 to 0.29	0.00 to −0.29
MODERATE	0.30 to 0.49	−0.49 to −0.30
STRONG	0.50 to 1.00	−1.00 to −0.50

Table 15: Correlation analysis

	KNOWLEDGE	ATTITUDE	PRACTICE
KNOWLEDGE	1		
ATTITUDE	.404**	1	
PRACTICE	.137	.284**	1

*Note: **. Correlation is significant at the 0.01 level (2-tailed).*

Hypothesis H_1: There is a significant relationship between knowledge and attitude of the antenatal women towards management of GDM.

The Pearson product correlation between knowledge and attitude was shown to be statistically significant and moderately positive ($r = .404$, $p < .001$). H_1 was therefore supported. This shows that an increase in knowledge towards GDM among antenatal women will lead to a higher attitude towards management of GDM among them.

Hypothesis H_2: There is a significant relationship between knowledge and practice towards management of GDM of the antenatal women towards management of GDM.

The Pearson product correlation between knowledge and practice towards management of GDM was demonstrated to be not statistically significant and weakly positive ($r = .137$, $p < .056$). H_2 was therefore not supported. This translates that an increase in knowledge towards GDM among antenatal women does not lead to a change in attitude towards management of GDM among them.

Hypothesis H_3: There is a significant relationship between attitude and practice towards management of GDM of the antenatal women towards management of GDM.

The Pearson product correlation between attitude and practice towards management of GDM was shown to be statistically significant and weakly positive (r = .284, p < .001). H_3 was therefore supported. This shows that an increase in attitude towards management of GDM among antenatal women will lead to a good practice towards management of GDM among them.

CHAPTER 5: DISCUSSION

The goal of the study was to evaluate antenatal women's knowledge, attitudes and practice towards management of GDM. Present study is a descriptive cross-sectional study and was carried out in IGMH. Antenatal women visiting for antenatal care at RHC of IGMH were the target respondents. This chapter focuses on the discussion of the results from chapter four and how they relate to other works of literature. Section five and six entails strength and limitations of the study and recommendations respectively. Areas for further research is described in the section six. This was the first study conducted in Maldives regarding KAP of management of GDM, whereas there were few studies that were focused on DM, though these studies were not focused on exploring KAP towards management GDM. Since no similar studies have been conducted in the Maldives, findings from this study can be utilized as a baseline for future studies.

5.1. KNOWLEDGE

From the findings of current study, it is evident that mean score for knowledge, attitude and practice towards management of GDM was 6.61 out of 12, 39.38 out of 50 and 19.83 out of 27, respectively and which is very low. Study conducted in Zambia by Yizukanji & Mwanakasale (2018) with 208 antenatal women, mean score for knowledge, attitude and practice were 6.54 out of 15, 15.9 out of 20, and 2.62 out of 5, respectively. Findings from the present study found that majority of 68% of antenatal women had low knowledge of GDM when 16.8% and 15.2% respondents had moderate and high knowledge of GDM respectively. These findings are similar to the studies from Yizukanji & Mwanakasale (2018) and Islam et al. (2017) in Bangladesh which reported poor knowledge of GDM in 64.4% and 60.7% of antenatal women, respectively. Study by Shafaiyaz & Rohini (2021) conducted in Chennai also found that only 30% of antenatal women had the good knowledge of GDM. In contrast majority of 58% antenatal women had good knowledge of GDM in the study by Price et al.

(2017) which was conducted in Samoa and Khanpaye et al. (2019) also reported only 4.1% of women with low knowledge of GDM in the study in Iran. Likewise, Md Jazli et al. (2021) also reported high level of GDM knowledge by antenatal women from their study in Malaysia followed by 8.3% with moderate and 6.1% with low knowledge. Comparatively, study conducted by Bhowmik et al. (2018) in Bangladesh showed low level of GDM knowledge in 10.6% of respondents average knowledge in 63.1% and good knowledge in 26.3% respondents.

Present study findings found that 54.3% respondents were not aware that GDM occurs first time during pregnancy. However, majority of 71.6% of participants were aware that GDM can be controlled by taking a desirable diet or by using medications. Respectively, 40.1% and 35% respondents recognized obesity and older age as the risk factors of GDM. Majority of 79.2% and 59.9% recognized family history of DM and previous history of GDM as risk factors, respectively. On the contrary study by Price et al. (2017) reported that 58% antenatal were aware that GDM can arise first time during pregnancy, however 19% did not agreed that it could. This study also found that risk factors of family history of DM, obesity, excessive weight gain and previous history of GDM were correctly recognized by only 48%, 25%, 16% and 15% of women, respectively (Price et al., 2017). Majority of 75.8% were found to have no knowledge of family history of DM, obesity and increasing age as risk factors of GDM in the study by Bhowmik et al. (2018). Findings of this study also showed that 66.9% did not know that GDM can be controlled with lifestyle modifications and medication (Bhowmik et al., 2018). Similar findings as the present study were showed in the study by Islam et al. (2017) which reported majority of 90.7% and 94.4% antenatal women with good knowledge about dietary changes and medications as management of GDM. This study also found, respectively, 71%, 57% and 25.2% women with knowledge of family history of DM, obesity and increasing age as risk factors of GDM (Islam et al., 2017).

In the current study, 70.1% had the knowledge that women with GDM should not consume foods high in carbohydrates and sugar. Findings also illustrated that 57.4% and 56.9% of respondents were not aware that intrauterine fetal death and development of type 2 DM in the future as complications arise from GDM, respectively. Similarly, Bhowmik et al. (2018) reported 63.9% did not recognize intrauterine fetal death and development of Type 2 DM as complications of GDM. Consistent findings with current study were also found by a study in Malaysia by Hussain et al. (2015) which found that higher number of respondents had the knowledge of dietary requirements for patients with GDM, however this study found lower mean score for management of GDM among respondents. This study also reported 54.4% with adequate knowledge and higher glycemic levels in respondents with inadequate knowledge (Hussain et al., 2015). Educational interventions towards GDM were reported to increase knowledge scores of antenatal women in studies by Sayakhot et al. (2016) and Minschart et al. (2020). Similarly, 77.3% increase in knowledge score was found by El-Ansary & Fouad (2020) with educational sessions focused on GDM.

5.2. ATTITUDE

Current study found that level of attitude for majority of 80.2% antenatal women were moderate, other 16.2% and 3.6% had respectively high and low attitude towards management of GDM. This was in agreement with the study by Md Jazli et al. (2021) in which most of antenatal women (49.5%) were found to have moderate level of attitude. Consistently, Yizukanji & Mwanakasale (2018) and Khanpaye et al. (2019) also found only 6.8% and 7.7% respondents with poor attitude towards GDM, respectively. Whereas Herath et al. (2017) found that though more than 75 % of public had either good or moderate knowledge towards DM, 88% had poor attitude towards DM.

Present study findings found that 85.3% and 85.8% agreed frequent testing of blood sugar and normal weight gain during pregnancy is necessary. Respectively 93.9%, 87.3% and 82.3%

antenatal women agreed that antenatal women should consume less sugar, less salty and oily foods and milk every day. However, 54.3% agreed they can consume as much as carbohydrate containing foods as they want. Moreover, respectively 87.8% and 77.7% antenatal women agreed that excessive wight gain can be controlled with exercise and performing 20-30 minutes of exercise daily is healthy. Similarly, most of the 54.21% of respondents in the study by Shafaiyaz & Rohini (2021) also agreed that physical exercise is healthy during pregnancy. However, (Shafaiyaz & Rohini (2021) also found 57.7% with perception that antenatal women should eat more for baby and their health. Consistent findings with current study were found by Price et al. (2017) in which reported that respectively 79% and 78% women agreed a healthy diet and regular physical exercise were proper lifestyle modifications to prevent GDM. On the contrary, respectively, 43% and 28% antenatal women were completely willing to make dietary changes and do regular physical exercise as reported by Islam et al. (2017). However, most of the respondents in this study demonstrated positive attitude towards monitoring for GDM, GDM control, and education (Islam et al., 2017). A qualitative study in Bangladesh by Biswas et al. (2020) found that even though, respondents perceive physical exercise and dietary adjustments as necessary for a woman with GDM, these lifestyle adjustments cannot be performed by pregnant women as physical exercise is problematic and they should eat more and take proper nutrition for themselves and the baby. Majority of 66.5% respondents agreed that they should give at least two years of interval between pregnancies in the current study which is consistent with the study by Md Jazli et al. (2021) in which most of the respondents were willing to use contraception between pregnancies.

5.3. PRACTICE TOWARDS MANAGEMENT OF GDM

Current study findings showed that practice level towards management of GDM of only 1% antenatal women were good whereas 59.9% and 39.1% had poor and moderate practice towards management of GDM, respectively. This was inconsistent with the study by Md Jazli et al.

(2021) which found majority of 54.1% had good practice towards GDM whereas only 1.4% was found with poor practice. Khanpaye et al. (2019) also found only 11.3% antenatal women with poor performance towards GDM. Similar findings with current study were reported by Yizukanji & Mwanakasale (2018) and found only 8.1% with good practice, 56.8% with fair practice and 35.1% with poor practice.

Present study findings found that 43.1% were always careful about their sugar levels. It also showed that 49.7% never consumed carbonated drinks in their pregnancy while only 15.7% consumed a lot of sugary foods. Majority of 61.9% never checked their daily calorie intake and 44.2% never performed 20 – 30 minutes of exercise daily. However, 60.4% antenatal women always checked their weight gain and 67% and 95.9% always checked their baby's kick count and always visited for their pregnancy check-ups. Herath et al. (2017) found the practice of public health towards DM were poor in which 62% never checked their glycemic levels and 65% used a lot of refined sugar in their diet. This study also found that majority of 80% never performed regular physical exercise. Similar findings with current study were showed in the study by Md Jazli et al. (2021) in respect with monitoring the kick count of baby and dietary modifications of GDM which had the highest practice scores. Similarly, in the study by Shafaiyaz & Rohini (2021) 58.95% reported that they follow-up weight during pregnancy and 52.84% visit for check-up and doctor regularly. This study also found that 47.89% checked their blood sugar regularly 44.21% followed their dietary regimen of GDM Shafaiyaz & Rohini (2021). A study in Ethiopia by Muche et al. (2019) also reported similar findings in which 44.8% performed moderate physical exercise and 48.4% took adequate nutrition. This study also reported 44.1% and 71.7% with alcohol and caffeine intake, respectively during pregnancy (Muche et al., 2019). Normal glycemic levels were reported to be more common with antenatal women who performed physical exercise (Muche et al., 2019). On the contrary, 37% followed

dietary recommendations while 71% never consumed processed food and a diet high in sugars as reported by Price et al. (2017).

Increased risk of GDM was reported with western dietary patterns which was high in sugar, carbohydrates and fat in the study by Sedaghat et al. (2017). Lifestyle practices towards management of GDM were found to reduce the risk of GDM in antenatal women. Badon et al. (2017) found that there was 21% lower risk of GDM with each 1-point rise in lifestyle score of antenatal women. Similarly decreased risk of GDM were reported with physical exercise throughout the pregnancy by Sanabria-Martínez et al. (2015) (RR = 0.69; P = 0.009) and Russo et al. (2015) (RR 0.72, P=.005). Educational interventions regarding GDM including group education sessions, digital and web-based programs were found to improve the lifestyle practice of antenatal women improving their pregnancy outcomes including glycemic control, weight gain of antenatal women, lower caesarean sections and fetal macrosomia (Gorbán de Lapertosa et al., 2021; R. He et al., 2022; Leblalta et al., 2022). Since practice towards management of GDM was low among antenatal women in the present study, educational interventions can be an effective strategy to improve their lifestyle practices.

5.4. RELATIONSHIP BETWEEN KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS MANAGEMENT OF GDM

In this current study, a significant positive correlation between knowledge and attitude was found with the Pearson's correlation (r = .404, p < .001). However, no correlation was found between knowledge and practice towards management of GDM (r = .137, p < .056). A weakly positive correlation between attitude and practice towards management of GDM was also found in the study (r = .284, p < .001). Similarly, no significant correlation between practice and attitude (p = 0.622) was found in the study by Yizukanji & Mwanakasale (2018) which aimed to find knowledge, attitude and practice towards GDM in Zambia. Though this study found a significant correlation between practice and knowledge (p = 0.008). Contrarily, a

positive relationship between attitude with practice and knowledge with practice was found in the study by Md Jazli et al. (2021) with regression. Moreover, a strong relationship was found between practice and attitude in this study, however Md Jazli et al. (2021) reported that any statistical significance between knowledge and attitude with practice was not found ($p > .05$). So, this study showed knowledge and attitude to be not a predictor for practice towards GDM (Md Jazli et al., 2021). Whereas, Khanpaye et al. (2019) found a significant and direct correlation between knowledge, attitude and performance towards GDM in their study. Current study findings indicated that an increase in knowledge towards GDM among antenatal women will lead to a higher attitude towards management of GDM among them, however it was found that an increase in knowledge towards GDM does not lead to a change in practice towards management of GDM among them. Moreover, since correlation between practice and attitude is weakly positive, it is important for future researchers to need to see what can be done to change practices towards management of GDM of antenatal women towards management of GDM.

5.5. STRENGTH AND LIMITATIONS

This is the first quantitative study aimed to assess the level of and relationship between knowledge, attitude and practice towards management of GDM among antenatal women in Maldives. The study can spur additional research because it is concentrated in a field where there is a dearth of literature. This study was done in the most populated city of the Maldives and in one of the primary hospitals. Therefore, the results of this study can assist direct the healthcare promotion efforts related to maternal and fetal health. Moreover, this study can provide a vital baseline information needed to improve current healthcare promotion activities and it can guide healthcare professionals in the maternal and child care to improve the maternal and fetal health through changes to educational interventions that are in place.

The significance of this research has some limitations. First and foremost, this study is cross-sectional, which was conducted over a month, and offers only statistics of KAP towards management of GDM for a limited number of Maldivian women towards management of GDM. Furthermore, since many women from islands will seek antenatal care at atoll and regional hospitals, confining the sample group to just one major hospital may omit a considerable portion of Maldivian women. Moreover, generalization of the findings to island areas can be a limitation since KAP levels towards management of GDM may vary among the women in Male' and atolls. The results may not be representative to general population of antenatal women in Maldives. In addition, the study didn't inquire about the sources of the clinical information respondents acquired from. Knowing the information's origins would have helped in choosing the best strategy for health promotion.

5.6. RECOMMENDATIONS

Few prenatal women in Male have a thorough understanding of GDM, and a sizable majority are unaware that GDM is a condition which can manifest for the first-time during pregnancy. Given the extremely high prevalence of obesity and DM in the Maldivian population which indicates a higher risk for GDM in Maldivian population, Maldivian healthcare practitioners are expected to continue to encounter this issue frequently. Therefore, it is crucial to implement ongoing interventions to improve antenatal women's KAP towards management of GDM.

5.6.1 For Hospital Management

Developing novel health promotion and education initiatives for GDM can be an area for future developments. In order to improve women's attitudes toward GDM, raise their knowledge of the condition, and encourage self-care behaviors and lifestyles, simple, clear educational programs should be regularly implemented. Though education sessions for antenatal women

are already in place around the hospitals in Maldives, it is crucial to have sessions specifically focused on GDM to be included in these. Moreover, maternity units should regularly hold training sessions and workshops on the treatment and care of GDM for medical professionals. Involving specialist healthcare professionals including diabetes educators, endocrinologists and nutritionist could also be an area which can promote knowledge and attitude need for the lifestyle practices necessary for optimal maternal and fetal health.

5.6.2 For Health Professionals in Public Health

It is ideal to utilize health promotions and teaching sessions focusing on GDM in all hospitals including, atoll and regional hospitals to cover maximum number of women in Maldivian population. It can be also utilized in health centers involving doctors and nurses caring for antenatal women. Prior to becoming pregnant, early education in the area is also probably crucial. Distribution of thorough information posters and pamphlets in schools and other places could be a successful way to increase knowledge of GDM in the community. Furthermore, current findings indicate that antenatal women's self-management skills were lacking, and a sizable percentage of them do not engage in regular physical exercise or adhere to a healthy diet. Public health campaigns might focus on this region. In addition to the distribution of pamphlets and posters, encouraging women to make suitable dietary modifications and engage in physical exercise might also be accomplished through the use of television and radio programs. Utilizing web-based education programs can also be helpful to accomplish this.

5.6.2 For Nurses and Doctors

A critical component of patient learning is the educational information provided by doctors and nurses. Therefore, it's crucial to make sure that enough clinic time is constantly set aside for educating women. As an alternative, pregnant women might benefit from the introduction of

education programs tailored specifically for GDM. In addition, since midwives are the healthcare professionals working most closer with antenatal and post-natal women, individual and group education sessions to improve knowledge and attitude towards GDM is vital to be carried out to promote practices of antenatal women towards management of GDM. Since a notable number of respondents in present study was found to consume sugary foods and eat late at night, educational initiatives should be created to improve antenatal women's adherence to a healthy diet. Developing dietary recommendations for antenatal women by referring to Mediterranean diet, AHEI and DASH which are proved to reduce GDM in studies could be an important strategy.

5.7. AREAS FOR FURTHER RESEARCH

To fully grasp the severity of the condition in the Maldivian population, future study on GDM prevalence, data on pregnancy outcomes due to the condition, and epidemiological data on the condition must be conducted among the Maldivian population. Moreover, it would be helpful to conduct further research on the dietary and lifestyle habits of the Maldivian population of antenatal women. Majority of participants in present research agreed that pregnant women should follow an exercise regimen and eat a diet low in sugar, salt, and oil. Therefore, it would be intriguing to see how much this reflects in their way of living. Since, it is also vital to understand the resources from where women acquire health information of GDM in order to focus on the optimal ways to provide information and hold health promotion campaigns, this is also an important area that the future research can focus on. Most importantly, future research must investigate practices of antenatal women towards management of GDM as poor lifestyle practices increases their risk of developing non-communicable diseases like Type 2 DM later in life in addition to consequences on their and fetal health.

5.8. CONCLUSION

This study offers a glimpse of the knowledge, attitudes, and practices towards management of GDM among pregnant women receiving antenatal care at IGMH, Maldives. The condition of GDM, its risk factors, consequences, and management of the condition were not well known to a sizable majority of antenatal women. Even though the majority of study participants had a moderate attitude toward GDM management, there is still much space for growth as only 16.24% of study participants had a high attitude toward various aspects of GDM. This study's key findings included the fact that only a tiny fraction of the population had high practice towards management of GDM and discrepancy between KAP towards management of GDM. Even though the majority of one by third had high and moderate knowledge and majority had moderate attitude, this was not reflected on their practice towards management of GDM. Study also indicated that change in knowledge level of respondents can change their attitude towards management of GDM. This study can therefore be utilized as a starting point for national GDM awareness efforts, and it can transform how GDM education is delivered by placing a stronger emphasis on knowledge, attitude, and most crucially, practice change. In the Maldives, there is no literature on any element of GDM, making these kinds of studies important for the adoption of techniques for disease control and prevention. The results of this study can aid healthcare professionals in developing effective strategies to raise awareness of GDM prevention in the Maldives and in carrying out health promotion activities related to GDM successfully.

APPENDIX 1: REFERENCES

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APPENDIX 2: QUESTIONNAIRE

SECTION A

SOCIODEMOGRAPHIC DATA (ފަރުދުގެ ތަފްޞީލު)

1. Age ތަރިން: _____
   Back Translation: Age

2. Highest academic qualification attained ހާސިލްކުރެވިފައި ހުންނަ ބޮޑަށް ދަށ ތަޢުލީމީ ދަރަޖަ
   Back Translation: Highest educational qualification obtained
   - ☐ No formal education ތަޢުލީމީ ދަރަޖައެއް ނެތް
   - ☐ Primary education ތަމްރީނުދޭ ތަޢުލީމު
   - ☐ Secondary education ސެކަންޑަރީ ތަޢުލީމު
   - ☐ Higher Education: Diploma / Degree / Master / PhD ބޮޑު ތަޢުލީމު: ޑިޕްލޮމާ، ޑިގްރީ، ޝ، ޕީ. ޗ.ޑ

3. Occupation ވަޒީފާ/ވަޒީފާގެ ގޮތް
   Back Translation: Employment
   - ☐ Domestic work ގޭގެ ތަކެއްޗާ ގުޅޭ ކަންތައް
   - ☐ Government job ސަރުކާރުގެ ވަޒީފާ
   - ☐ Private sector ޚާއްޞަ ދާއިރާގެ ވަޒީފާ
   - ☐ Owned business ތަމްސީލުކުރާ ވިޔަފާރި

4. Family history of Diabetes ދިއާބެޓިސް ހުރި ފަރާތެއް ގެ ތަރިން ތިބެ ހުންނަ ގޭ
   Back Translation: Do you have family history of diabetes?
   - ☐ Yes ހާ
   - ☐ No ނޫ

5. Previous history of GDM ކުރީގެ ދުވަސްތަކުގައި ލޭ ގ ގ ހުރި ކަމަށް ބަލައިގެ ހުރި ކަމެއް
   Back Translation: Have you had high blood sugar in a past pregnancy?
   - ☐ Yes ހާ
   - ☐ No ނޫ
   - ☐ Don't know ނޭނގޭ

6. Para ބޭބެ ލިބި ހުންނަ ގޮތް
   Back Translation: Number of children born
   - ☐ Nullipara ކުއްޖެ ނެތް ގޮތް
   - ☐ Multipara ބަލަމުންދާ ގޮތް

Commented [1]: Suggest to change to domestic work

Commented [s2R1]: Have revised

SECTION B

KNOWLEDGE TOWARDS GESTATIONAL DIABETES MELLITUS

މާބަނޑު ދުވަސްވަރު ދިމާވާ ހަކުރު މައްޗަށް ދިއުމުގެ ބައްޔާމެދު (ޖީޑީއެމް) މައުލޫމާތު ލިބިފައިވާ މިންވަރު.

1. *Original question:* Gestational Diabetes Mellitus (GDM) is a form of diabetes that first is recognized during pregnancy.

ޖީޑީއެމް އަކީ މާބަނޑު ދުވަސްވަރު ފުރަތަމަ ފަހަރަށް ދިމާވާ ހަކުރު ބަލީގެ ވައްތަރެކެވެ.

Back Translation

GDM is a form of diabetes mellitus that first occurs during pregnancy.

☐ Yes — އާން ☐
☐ No — ނޫން ☐
☐ Don’t Know — ނޭނގެ ☐

2. *Original question:* GDM may be controlled with diet or medication and insulin.

ކާއުމަށް އެދޭވާ ބަދަލު ގެނައުމުން ނުވަތަ ބޭސް އަދި އިންސިއުލިން ބޭނުންކުރުމުން ޖީޑީއެމް ކޮންޓްރޯލް ކުރެވިދާނެއެވެ.

Back Translation

GDM can be controlled by making desirable dietary changes or by using medication and insulin.

☐ Yes — އާން ☐
☐ No — ނޫން ☐
☐ Don’t Know — ނޭނގެ ☐

3. *Original question:* Family history of Diabetes Mellitus is a risk factor for GDM.

އާއިލާގައި ހަކުރު ބަލި ޖެހިފައިވާ މީހުން ތިބިނަމަ، މާބަނޑު ދުވަސްވަރު ޖެހޭ ހަކުރުބަލި ޖެހުމުގެ ފުރުސަތު ބޮޑެވެ.

Back Translation

If you have family history of diabetes, you are more likely to develop GDM.

☐ Yes — އާން ☐
☐ No — ނޫން ☐
☐ Don’t Know — ނޭނގެ ☐

4. *Original question:* Pre-pregnancy obesity and higher weight gain during pregnancy is not a risk factor for GDM.

މާބަނޑުވުމުގެ ކުރިން މާބޮޑަށް ފަލަވެ ބަރުދަން މަތިވެފައި މާބަނޑު ދުވަސްވަރު ބަރުދަން މާބޮޑަށް އިތުރުވުމަކީ ޖީޑީއެމް ޖެހުމުގެ ފުރުސަތު އިތުރުވާ ކަމެއް ނޫނެވެ.

Back Translation

Being overweight before pregnancy and excessive weight gain during pregnancy do not increase the risk of GDM.

☐ Yes — އާން ☐
☐ No — ނޫން ☐
☐ Don’t Know — ނޭނގެ ☐

5. *Original question:* Advanced maternal age (35 years and above) is not a risk factor for GDM.

ތުންބު ފާރަތްކަން ތިމާގެއަށް (35 އަހަރުގެ ފަހު ތުންބުގަތުމަށް) ފާހަގަ ވުމަކީ ތިމާގެ ތެރެއިން ގެއްލުމެއް ތަނަވަސްކުރާ ތަކެއް ނޫނެވެ.

Back Translation

Being pregnant with an older age (above 35 years of age) does not increase the risk of GDM.

- ☐ Yes ☐ ހާ
- ☐ No ☐ ނޫ
- ☐ Don't Know ☐ ނޭނގޭ

6. *Original question:* History of Polycystic Ovarian Syndrome (PCOS) can increase the risk of development of GDM.

ގާތަކިއުލަރ ސިސްޓް ތުދުވުމާ ގުޅޭ ތަކެއް ތިމާގެ ތެރެއިން (ޕީސީޯއެސް) ހުރިކަމަށް ދެނެގަތުމުން ގެއްލުމެއް ތަނަވަސްކުރާ ތަކެއް ތިމާގެ ތެރެއިން ދެނެގަނެވޭ.

Back Translation

The risk of GDM is increased if you have a condition of developing cyst in ovary or polycystic ovary syndrome (PCOS).

- ☐ Yes ☐ ހާ
- ☐ No ☐ ނޫ
- ☐ Don't Know ☐ ނޭނގޭ

7. *Original question:* Women who've been diagnosed with GDM in previous pregnancy have a high risk to get GDM in current pregnancy.

ކުރިން ތަދުވެ ތުންބުގައި ގެއްލުމެއް ހުރި ފަރާތްތަކަށް ފަހުގެ ތުންބުގައި ވެސް ގެއްލުމެއް ލިބުމުގެ ދަށްވުރެ ގިނަ ހެއްވެ.

Back Translation

If you have had high blood sugar in a past pregnancy, you are more likely to develop GDM this time.

- ☐ Yes ☐ ހާ
- ☐ No ☐ ނޫ
- ☐ Don't Know ☐ ނޭނގޭ

8. *Original question:* Once pregnant women have been diagnosed with GDM, she needs to monitor her sugar level called blood sugar profile (BSP).

ތިމާގެ ކުރިޔަށް ތުންބުގައި ތިބި ކަމަށް ދެނެގަތުމުން، ތިމާގެ ލޭބު ކަންތައް ބަލަހައްޓަން ގެންދަންވާނެ.

Back Translation

If you are diagnosed with GDM, you will need to monitor your blood sugar levels.

- ☐ Yes ☐ ހާ
- ☐ No ☐ ނޫ
- ☐ Don't Know ☐ ނޭނގޭ

9. *<u>Original question:</u>* After delivery, women who are diagnosed with GDM antenatally should monitor her blood sugar level.

ޖީޑީއެމް ހުރިނަމަ، ވިހެއުމަށްފަހުވެސް ލޭގައި ހަކުރު ހުރި މިންވަރު ބަލަމުން ގެންދަން ޖެހޭނެއެވެ.

<u>Back Translation</u>

If you have GDM, you should continue to monitor your blood sugar after delivery.

- ☐ Yes — ☐ އާން
- ☐ No — ☐ ނޫން
- ☐ Don't Know — ☐ ނޭނގެ

10. *<u>Original question:</u>* Pregnant women with GDM are allowed to take a diet especially carbohydrate and sugar as usual.

ޖީޑީއެމް ހުރި މީހަކު ކެއުމުގައި ކުރިއަށް އެއްގޮތަށް ކާބޯހައިޑްރޭޓް އެއްޗެހި ކާނާއި ހަކުރު އެއްޗެހި ކާން ބޭނުންކުރުމަށް ހުއްދަދެވިފައިވެއެވެ.

<u>Back Translation</u>

A person with GDM should continue to eat food consuming carbohydrates and sugar.

- ☐ Yes — ☐ އާން
- ☐ No — ☐ ނޫން
- ☐ Don't Know — ☐ ނޭނގެ

11. *<u>Original question:</u>* Women with GDM have a high risk for intrauterine death.

ޖީޑީއެމް ހުންނަނަމަ، ދަރިފުޅު ބަނޑުގައި މަރުވުމުގެ ނުރައްކާ އިތުރުވެއެވެ.

<u>Back Translation</u>

If you have GDM, you have an increased risk of fetal death.

- ☐ Yes — ☐ އާން
- ☐ No — ☐ ނޫން
- ☐ Don't Know — ☐ ނޭނގެ

12. *<u>Original question:</u>* GDM is a risk factor for development of type 2 Diabetes Mellitus in future.

ޖީޑީއެމް ހުންނަނަމަ، ކުރިމަގުގައި ހަކުރު ބަލީގެ ޓައިޕް 2 ޖެހުމުގެ ފުރުޞަތު އިތުރުވެއެވެ.

<u>Back Translation</u>

If you have GDM, you have an increased risk of developing type 2 Diabetes Mellitus in the future.

- ☐ Yes — ☐ އާން
- ☐ No — ☐ ނޫން
- ☐ Don't Know — ☐ ނޭނގެ

SECTION C

ATTITUDE TOWARDS GESTATIONAL DIABETES MELLITUS (GDM

ފާސްޖެ ފުރަތަމަކަށ ތިއްބާ ހާލަތުގައ ހުރެދާނ ބަލައ ބަލައ ބަލަންވާ ކަންތައ (ދިޔައ ހުށ ހާލަތުގައ)

1. *Original question:* Blood sugar levels need to be checked and monitored frequently.
ތަފާތުވަރަށ ދާނެ ހަމައ ބަލައ ބަލަންވާ ލޭ ލުއ ލޭ ބަލަންވާ ކަމަށ ވިދާޅުވ.

Back Translation
Blood sugar levels should be tested frequently.

- ☐ Strongly disagree — ☐ ނުވަތަ ވަރަށ ދަށ ދަރަޖަ
- ☐ Disagree — ☐ ދަށ ދަރަޖަ
- ☐ Neutral — ☐ ވަރެ ދަރަޖަ
- ☐ Agree — ☐ ދަށ ދަރަޖަ
- ☐ Strongly agree — ☐ ވަރަށ ބޮޑ ދަށ ދަރަޖަ

2. *Original question:* I need to control my weight gain during pregnancy to a normal level.
ފާސްޖެ ފުރަތަމަކަށ ތިއްބާ ހާލަތުގައ ހުރެ ބަލައ ބަލަންވާ ލޭ ލުއ ލޭ ބަލަންވާ ކަމަށ ވިދާޅުވ.

Back Translation
During pregnancy, weight should be controlled in a normal range.

- ☐ Strongly disagree — ☐ ނުވަތަ ވަރަށ ދަށ ދަރަޖަ
- ☐ Disagree — ☐ ދަށ ދަރަޖަ
- ☐ Neutral — ☐ ވަރެ ދަރަޖަ
- ☐ Agree — ☐ ދަށ ދަރަޖަ
- ☐ Strongly agree — ☐ ވަރަށ ބޮޑ ދަށ ދަރަޖަ

3. *Original question:* I need to avoid too much intake of sugar such as granulated sugar and sweets.
ހަލުވ ހަމަ ދަށ ދަރަޖަ ހުރ ބަލައ ބަލަންވާ ލޭ ލުއ ލޭ ބަލަންވާ ކަމަށ ވިދާޅުވ.

Back Translation
Excessive consumption of sugar should be avoided.

- ☐ Strongly disagree — ☐ ނުވަތަ ވަރަށ ދަށ ދަރަޖަ
- ☐ Disagree — ☐ ދަށ ދަރަޖަ
- ☐ Neutral — ☐ ވަރެ ދަރަޖަ
- ☐ Agree — ☐ ދަށ ދަރަޖަ
- ☐ Strongly agree — ☐ ވަރަށ ބޮޑ ދަށ ދަރަޖަ

4. *Original question:* I can take as many carbohydrates as I want.
ބޭނުން ވަރަކަށް ކާބޯހައިޑްރޭޓް ހިމެނޭ ކާނާ ބޭނުންކުރެވިދާނެއެވެ.

Back Translation
You can consume as many carbohydrate containing foods as you want.

- ☐ Strongly disagree — ☐ އެއްގޮތަކަށްވެސް ގަބޫލެއް ނުކުރަން
- ☐ Disagree — ☐ ގަބޫލެއް ނުކުރަން
- ☐ Neutral — ☐ ވަކިގޮތަކަށް ނުދެކެން
- ☐ Agree — ☐ ގަބޫލު ކުރަން
- ☐ Strongly agree — ☐ ވަރަށް ބާރަށް ގަބޫލު ކުރަން

5. *Original question:* I should reduce salt and fat intake in my daily menu.
ދުވާލެއްގެ މެނޫގައި ކާ ކެއުމުގައި ލޮނާއި، ތެލުގެ ބޮޑުމިނެއް ހިމެނުން މަދުކުރަން ޖެހޭނެއެވެ.

Back Translation
Amount of salt and oil in your daily diet should be reduced.

- ☐ Strongly disagree — ☐ އެއްގޮތަކަށްވެސް ގަބޫލެއް ނުކުރަން
- ☐ Disagree — ☐ ގަބޫލެއް ނުކުރަން
- ☐ Neutral — ☐ ވަކިގޮތަކަށް ނުދެކެން
- ☐ Agree — ☐ ގަބޫލު ކުރަން
- ☐ Strongly agree — ☐ ވަރަށް ބާރަށް ގަބޫލު ކުރަން

6. *Original question:* Antenatal exercise can prevent excessive gestational weight gain.
މާބަނޑު ދުވަސްވަރު ކަސްރަތުކުރުމުން، މާބަނޑު ދުވަސްވަރު އިތުރުވާ ބަރުދަން މާބޮޑަށް އިތުރުވުމަށް ހިފެހެއްޓިދާނެއެވެ.

Back Translation
Exercise during pregnancy can help prevent excessive weight gain during pregnancy.

- ☐ Strongly disagree — ☐ އެއްގޮތަކަށްވެސް ގަބޫލެއް ނުކުރަން
- ☐ Disagree — ☐ ގަބޫލެއް ނުކުރަން
- ☐ Neutral — ☐ ވަކިގޮތަކަށް ނުދެކެން
- ☐ Agree — ☐ ގަބޫލު ކުރަން
- ☐ Strongly agree — ☐ ވަރަށް ބާރަށް ގަބޫލު ކުރަން

7. *Original question:* I should do antenatal exercise at least 20 to 30 minutes per day.
މާބަނޑު ދުވަސްވަރު ދުވާލަކު މަދުވެގެން 20-30 މިނެޓުގެ ވަގުތު ކަސްރަތުކުރަން ޖެހޭނެއެވެ.

Back Translation
During pregnancy, at least 20-30 minutes exercise should be done per day.

- ☐ Strongly disagree — ☐ އެއްގޮތަކަށްވެސް ގަބޫލެއް ނުކުރަން
- ☐ Disagree — ☐ ގަބޫލެއް ނުކުރަން
- ☐ Neutral — ☐ ވަކިގޮތަކަށް ނުދެކެން
- ☐ Agree — ☐ ގަބޫލު ކުރަން
- ☐ Strongly agree — ☐ ވަރަށް ބާރަށް ގަބޫލު ކުރަން

8. *Original question:* I should drink fresh milk every day.

ދުވަހަކު ފުރިހަމަ ބޮޑި ޖަހަންވާނެ.

Back Translation

You should drink fresh milk daily.

- ☐ Strongly disagree ☐ ގާތްގަނޑަށްވެސް ހަނދާން ނުކުރަން
- ☐ Disagree ☐ ހަނދާން ނުކުރަން
- ☐ Neutral ☐ ވަކިވެގަންނަން ނުދެނެގެން
- ☐ Agree ☐ ހަނދާން ކުރަން
- ☐ Strongly agree ☐ ވަރަށް ބޮޑަށް ހަނދާން ކުރަން

9. *Original question:* I should monitor fetal movement every day.

ދުވަހަކު ކުއްތާ ހަރަކާތް ބެލުމަށް ތަކުރާރު ކުރަންވާނެ.

Back Translation

Baby's kick count should be checked every day.

- ☐ Strongly disagree ☐ ގާތްގަނޑަށްވެސް ހަނދާން ނުކުރަން
- ☐ Disagree ☐ ހަނދާން ނުކުރަން
- ☐ Neutral ☐ ވަކިވެގަންނަން ނުދެނެގެން
- ☐ Agree ☐ ހަނދާން ކުރަން
- ☐ Strongly agree ☐ ވަރަށް ބޮޑަށް ހަނދާން ކުރަން

10. *Original question:* I plan to space for the next pregnancy at least 2 years.

ފުރި ހަމާ ނިންމާ ދުވަސްތަކުގެ ފަހުން ކަނޑަކަށް 2 ހަފްތާ ދުވަހުގެ ދުރަކަށް ދާންވާނެ ކަމަށް ހީނދެ.

Back Translation

I think I should give at least 2 years between next pregnancy.

- ☐ Strongly disagree ☐ ގާތްގަނޑަށްވެސް ހަނދާން ނުކުރަން
- ☐ Disagree ☐ ހަނދާން ނުކުރަން
- ☐ Neutral ☐ ވަކިވެގަންނަން ނުދެނެގެން
- ☐ Agree ☐ ހަނދާން ކުރަން
- ☐ Strongly agree ☐ ވަރަށް ބޮޑަށް ހަނދާން ކުރަން

SECTION D

PRACTICE TOWARDS GESTATIONAL DIABETES MELLITUS

ދަރިވަރުގެ ދަތުރުގައި ކައިރީގައި ހުންނަ ބައެއް ފަރާތްތަކުން ދެވޭ ސުވާލުތަކުގެ ޖަވާބު.

1. *Original question:* Do you care about your sugar level?
ހާދަ ހަކަށް ހާސްކަމުން ލަސްވާ ހެއްކަ؟

Back Translation
Are you careful about your blood sugar levels?

- ☐ Never ☐ ނެތްފަދަ ކަމެއް
- ☐ Occasionally ☐ ތަނަވަސް
- ☐ Always/ Frequently ☐ ގަދަ ހިނގާ/ތަނަވަސް

2. *Original question:* Do you drink carbonated drinks?
ކާބޯނޭޓް ކުރެވުނު ބުދިގަ ބޮއެ ވަކި ގޮތަކަށް ބޯ؟

Back Translation
Do you consume carbonated or fizzy drinks?

- ☐ Never ☐ ނެތްފަދަ ކަމެއް
- ☐ Occasionally ☐ ތަނަވަސް
- ☐ Always/ Frequently ☐ ގަދަ ހިނގާ/ތަނަވަސް

3. *Original question:* Do you take any refined sugar or sugary foods?
ހަކަށް ކުރެވި ހަކަ ހުންނަ ކާފަ ބޯ ވަކި ގޮތަކަށް ބޯ؟

Back Translation
Do you consume sugar or sugary foods?

- ☐ Never ☐ ނެތްފަދަ ކަމެއް
- ☐ Occasionally ☐ ތަނަވަސް
- ☐ Always/ Frequently ☐ ގަދަ ހިނގާ/ތަނަވަސް

4. *Original question:* Do you eat late at night?
ރެއަށްފަހު ދެކޮޅަށް ބޯ؟

Back Translation
Do you eat late at night?

- ☐ Never ☐ ނެތްފަދަ ކަމެއް
- ☐ Occasionally ☐ ތަނަވަސް
- ☐ Always/ Frequently ☐ ގަދަ ހިނގާ/ތަނަވަސް

5. *Original question:* Do you count your calorie intake every day?
ދުވަހަކު ކެލަރީގެ ކަނޑައެޅިފައި ހުރި ޙައްދަ ބަލަހައްޓަނީ؟

Back Translation
Do you check your daily caloric intake?

- ☐ Never ☐ ނެތް
- ☐ Occasionally ☐ ކޮންމެ ފަހަރު
- ☐ Always/ Frequently ☐ ފުރިހަމަ/ގިނަ ފަހަރު

6. *Original question:* Do you do antenatal exercise at least 20 to 30 minutes per day?
ދުވަހަކު 20 ގާތް 30 ޚިނދެއް ވަކި ކުރަނީ ގަރުބާ ކުއްލި ވ්‍යායාම؟

Back Translation
Do you exercise for at least 20 to 30 minutes every day?

- ☐ Never ☐ ނެތް
- ☐ Occasionally ☐ ކޮންމެ ފަހަރު
- ☐ Always/ Frequently ☐ ފުރިހަމަ/ގިނަ ފަހަރު

7. *Original question:* Do you monitor your baby's kick every day?
ކުއްޖާ ކައިގަނޑު ދުވަހަކު ކިތަންމެ ފަހަރު ބަލަހައްޓަނީ؟

Back Translation
Do you check the baby's kick count every day?

- ☐ Never ☐ ނެތް
- ☐ Occasionally ☐ ކޮންމެ ފަހަރު
- ☐ Always/ Frequently ☐ ފުރިހަމަ/ގިނަ ފަހަރު

8. *Original question:* Do you monitor your weight gain?
ބަރުދަން ވެގެންދާ ދުވަހަކު ބަލަހައްޓަނީ؟

Back Translation
Do you check how much weight you gain?

- ☐ Never ☐ ނެތް
- ☐ Occasionally ☐ ކޮންމެ ފަހަރު
- ☐ Always/ Frequently ☐ ފުރިހަމަ/ގިނަ ފަހަރު

9. *Original question:* Do you visit for antenatal checkup regularly as advised?
ވިދުމާފާ ގަރުބާ ބަލަހައްޓަން ދާނެ ތާރީޚުތަކުގައި ގަރުބާ ދޮށަށް ދާ ގޮތް؟

Back Translation
Do you have regular pregnancy check-ups and see your doctor as directed?

- ☐ Never ☐ ނެތް
- ☐ Occasionally ☐ ކޮންމެ ފަހަރު
- ☐ Always/ Frequently ☐ ފުރިހަމަ/ގިނަ ފަހަރު

APPENDIX 3: INFORMATION SHEET FOR PARTICIPANTS

ދިވެހިރާއްޖޭގެ ޤައުމީ ޔުނިވަރސިޓީ
THE MALDIVES NATIONAL UNIVERSITY

Information Sheet

ބައިވެރިންނަށް ހިއްސާކުރާ މައުލޫމާތު

މައިބަނޑު ދުވަސްވަރު ކުރިމަތިވާ ލޭގައި ހަކުރު ގިނަވުމުގެ ބައްޔާމެދު އިންދިރާ ގާންދީ މެމޯރިއަލް ހޮސްޕިޓަލްގެ ދަރިމައިވުމުގެ ސިއްހަތާގެ ކުލިނިކަށް ވަޑައިގަންނަވާ މާބަނޑު އަންހެނުން ދެކޭގޮތާއި، މައުލޫމާތު ލިބިފައިވާ ވިސްނުމާއި [illegible] އަމަލުކުރާގޮތް ދެނެގަތުމަށް ކުރާ މި ދިރާސާގައި ބައިވެރިވުމަށް ތިޔަބޭފުޅާއަށް ދަޢުވަތުދެމެވެ.

މި ދިރާސާގެ ބޭނުމަކީ މާބަނޑު ދުވަސްވަރު ކުރިމަތިވާ ލޭގައި ހަކުރު ގިނަވުމުގެ ބައްޔާމެދު އައި.ޖީ.އެމް.އެޗްގެ ދަރިމައިވުމުގެ ސިއްހަތާގެ ކުލިނިކަށް ވަޑައިގަންނަވާ މާބަނޑު އަންހެނުން ދެކޭގޮތާއި، މައުލޫމާތު ލިބިފައިވާ ވިސްނުމާއި [illegible] އަމަލުކުރާގޮތް ދެނެގަތުމެވެ.

މި ދިރާސާގައި ބައިވެރިވުމަށް ތިޔަފަރާތުން ކުރަންޖެހޭ ކަމަކީ ސުވާލު ފޯމުގައިވާ ގޮތަށް ދިރާސާ ކުރާ ފަރާތުން ކުރާ ސުވާލުތަކަށް ޖަވާބު ދިނުމެވެ. މިކަމަށް 15-10 މިނެޓް ހޭދަވާނެއެވެ.

މި ދިރާސާގައި ތިޔަފަރާތުން ދޭ މައުލޫމާތުގެ ސަބަބުން ތިޔަފަރާތަށް ކުރިމަތިވާނެ އެއްވެސް ނުރައްކަލެއްނެތެވެ.

މި ދިރާސާގެ ނަތީޖާ ޝާއިޢުކުރެވިދާނެ ކަމެކެވެ. ނަމަވެސް ތިޔަފަރާތުގެ ނަން ހާމަވާފަދަ، ނުވަތަ ޒާތީ މައުލޫމާތު އެނގޭނެ އެއްވެސް މައުލޫމާތެއް [illegible] ނުވަތަ ރިޕޯޓެއްގައި ޝާއިޢު ނުކުރާނެކަން ޔަޤީންކަން ދެމެވެ. ބައިވެރިންގެ ޒާތީ މައުލޫމާތުގެ ސިއްރު ހިފެހެއްޓުމަށްޓަކައި، މި ދިރާސާގައި އެއްކުރާ މައުލޫމާތު ހަމައެކަނި ބެލޭނީ ދިރާސާކުރާ ފަރާތަށެވެ. އަދި [illegible] އެއްވެސް މައުލޫމާތެއް ނުނަގާނެވެ. މި ދިރާސާގައި ތިޔަފަރާތުން ބައިވެރިވުމަކީ އަމިއްލަ އިޚްތިޔާރުގައެވެ. ބައިވެރި ނުވުމުން ތިޔަފަރާތަށް އެއްވެސް ގެއްލުމެއް ނާންނާނެއެވެ. އަދި، ބޭނުންވާ ގަޑިއެއްގައި ދިރާސާގެ ކޮންމެ ހިސާބަކުންވެސް މި ދިރާސާއިން ތިޔަ ފަރާތުން ބޭނުންނަމަ އެއްވެސް އުޒުރަކާނުލައި ވަކިވެވޭނެއެވެ. އަދި، ތިޔަ ފަރާތުން ދިން މައުލޫމާތު ނައްތާލެވޭނެއެވެ.

މި ދިރާސާ ކުރަނީ [illegible] ގައި އާސިޔާ އިބްރާހީމްގެ ބެލެހެއްޓުމުގެ ދަށުން އައިޝަތު [illegible]އެވެ. އެފަރާތާ ގުޅޭނެ ނަންބަރު 9784892 އެވެ. އެއްވެސް ކަމަކާ ގުޅިގެން މައުލޫމާތު ސާފުކުރަން ނުވަތަ ދިރާސާއާމެދު ކަންބޮޑުވާކަމެއް އޮތްނަމަ، އެފަރާތާ ގުޅުން [illegible].

މި ދިރާސާއަށް [illegible] ދިވެހިރާއްޖޭގެ ޤައުމީ ޔުނިވަރސިޓީގެ [illegible]

APPENDIX 4: CONSENT FORM

C

Consent
form

(ތާރީޚް)

އިޤްރާރު ފޯމް

މާބަނޑު ދުވަސްވަރު ކުރިމަތިވާ ލޭގައި ހަކުރު ގިނަވުމުގެ ބައްޔާމެދު [illegible] [illegible] [illegible] [illegible] ދަރިމައިވުމުގެ ސިއްޙަތާބެހޭ ކްލިނިކަށް ވަޑައިގަންނަވާ މާބަނޑު އަންހެނުން ދެކޭގޮތާއި، މަޢުލޫމާތު ލިބިފައިވާ މިންވަރާއި އާއްމުކޮށް އަމަލުކުރާގޮތް ދެނެގަތުމަށް ކުރާ ދިރާސާ.

މަތީގައި ބަޔާންކޮށްފައިވާ ދިރާސާއާ ބެހޭ މަޢުލޫމާތު އަޅުގަނޑު ކިޔާލީމެވެ. އަދި އޭގައިވާ މަޢުލޫމާތު އަޅުގަނޑަށް އެނގިއްޖެއެވެ. މި ގޮތުގެ މަތިން އަޅުގަނޑުގެ ޝަޚްޞީ މަޢުލޫމާތު ސިއްރުކުރެވޭނެގޮތުގެ މަތިން، އެ ދިރާސާގައި ބައިވެރިވުމަށް އަޅުގަނޑު އިޤްރާރުވަމެވެ.

ދެންނެވުނު ދިރާސާއިން ވަކިވުމާއި، ފޯރުކޮށް ދިން މަޢުލޫމާތު އަނބުރާ ގެންދިއުމަށް ކޮންމެ ވަގުތެއްގައިވެސް އަޅުގަނޑަށް ބޭނުންނަމަ، އަޅުގަނޑަށް ލިބިފައިވާ ޙައްޤެއްކަން އަޅުގަނޑަށް އެނގޭއެވެ.

މި ދިރާސާއަކީ ދިވެހިރާއްޖޭގެ ޤައުމީ ޔުނިވަރސިޓީގެ [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ކުރިއަށް ގެންދިއުމަށް ހުއްދަ ލިބިފައިވާ ދިރާސާއެއްކަން އަޅުގަނޑަށް އެނގޭއެވެ.

ނަން:...

ސޮއި:

APPENDIX 5: BUDGET

	Item Detail	Amount	Rate in MVR	Rate in USD	Total in MVR	Total in USD
Equipment and Supplies	Pen	05	MVR12	USD0.78	MVR60	USD3.88
	Clip Board	04	MVR40	USD2.59	MVR160	USD10.36
	Puncher	01	MVR70	USD4.53	MVR70	USD4.53
	Stapler	01	MVR25	USD1.62	MVR25	USD1.62
	Staples	02 box	MVR10	USD0.65	MVR20	USD1.29
Facilities and Administrative Cost	Printing	197 prints (7 page-Questionnaire)	MVR1 per page	USD 0.065	MVR 1379	USD 89.28
Total					MVR 1714	USD 110.97

APPENDIX 6: CONSENT TO ADAPT THE QUESTIONNAIRE

<s @student.mnu.edu.mv>

Regarding the questionnaire of your study "Association between Knowledge, Attitude and Practice on Gestational Diabetes Mellitus among Antenatal Women in Community Health Clinics in Selangor "

NORAZLINA MD JAZLI <azlinajazli@uitm.edu.my> Mon, Feb 28, 2022 at 1:14 PM
To: <s @student.mnu.edu.mv>

Hi

Thank you for your interest in my questionnaire. This questionnaire was modified by me and my team. Feel free to use it but if u used it in your study, please do citate our name in your reference. Wish you all the best in your studies.

NORAZLINA BINTI MD JAZLI
Lecturer
Centre for Nursing Studies
Faculty of Health Sciences
Universiti Teknologi MARA (UiTM)
Selangor Branch, Puncak Alam Campus,
42300,Bandar Puncak Alam,
Selangor, Malaysia
Alt email : jazlynn2780@gmail.com
ORCID iD : 0000-0003-4493-7906
Tel : +603 3258 4580
H/p : +6019 540 9985

[Quoted text hidden]

GDM questionnaire - proposal master.pdf
241K

APPENDIX 7: NO OBJECTION LETTER FROM IGMH

16th March 2022
137-B(NHA)/MISC/2022/014

No Objection to Conduct Research

Research Title: knowledge, attitude and practice towards management of Gestational Diabetes Mellitus (GDM) among antenatal women visiting for antenatal care at reproductive health center, Indira Gandhi Memorial Hospital

Researcher: .

This is to inform you that we have no objection to conduct the above named research at this institution. However, please note that prior to your data collection, it is mandatory to get ethical approval from the NHRC.

Best Regards,

Fathimath Rasheeda
On behalf of National Healthcare Academy
Indira Gandhi Memorial Hospital
Male', Maldives

APPENDIX 8: APPROVAL LETTER FROM NHRC

بسم الله الرحمن الرحيم

National Health Research Council
Ministry of Health
Male'
Republic Of Maldives

12th September 2022

Male'
Republic of Maldives

Approval of Research Proposal

Title of Study Proposal: Knowledge, attitude and practice towards management of gestational diabetes mellitus (gdm) among antenatal women visiting for antenatal care at reproductive health center, indira gandhi memorial hospital

Researcher:

Dear

The members of the National Health Research Council have reviewed your research proposal "Knowledge, attitude and practice towards management of gestational diabetes mellitus (gdm) among antenatal women visiting for antenatal care at reproductive health center, indira gandhi memorial hospital.". Following the review, the proposed study has been approved by the council.

The research registration number is NHRC/2022/15.

It is requested that the final report of the research and research abstract to be forwarded to the Ministry of Health for future reference and use. Please also note that researchers are required to submit a "Yearly Monitoring Form" to NHRC for review by NHRC on progress of researches conducted in Maldives.

Dr. Ahmed Ashraf
Chair of National Health Research Council (NHRC)

Tel: (960) 3328887, Fax: (960) 3330699, Email: ppd@health.gov.mv