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Development of a questionnaire to assess knowledge in women with gestational diabetes

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**DEVELOPMENT OF A QUESTIONNAIRE TO ASSESS
KNOWLEDGE IN WOMEN WITH GESTATIONAL
DIABETES**

BY

CARON MCLARTY

**A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE AWARD OF**

**BACHELOR OF NURSING (HONOURS) SCHOOL OF
NURSING, EDITH COWAN UNIVERSITY**

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

Women with a history of gestational diabetes mellitus (GDM) have a significantly increased risk of developing diabetes mellitus in later life. A lifestyle which includes healthy eating habits, weight control, regular exercise, and stress management has been associated with preventing or delaying the onset of diabetes mellitus and its associated complications. To care for themselves women require education about and knowledge of strategies that have been associated with preventing diabetes. An essential part of education is knowledge assessment. Women with GDM have been largely overlooked in the development of instruments to measure knowledge of diabetes.

Orem's general theory of nursing guided this research. Orem asserts that self care is necessary to maintain health and well-being and that it is the role of nurses to assist individuals to self care. Nurses assess individuals' needs and identify self care deficits. Knowledge deficits may be identified with the use of questionnaires.

This study used a methodological design to develop a questionnaire to assess knowledge in women who have been diagnosed with GDM and to establish the questionnaire's validity and reliability. The questionnaire assessed women's knowledge of their potential for developing diabetes and lifestyle factors that are associated with reducing the risk of developing diabetes.

Content validity was established by health professionals involved with caring for women with GDM and a biostatistician. Evidence of construct validity was provided using a contrasted groups approach. The questionnaire was distributed to 62 women. Thirty one women who had been diagnosed with GDM and who had received diabetes education

formed the GDM group. The non GDM group was comprised of 31 women who had not been diagnosed with GDM. A paired t-test was performed on the total scores from the two groups. The score from the GDM group ($M = 15.9$) was significantly higher than the non GDM group score ($M = 12.4$), $t(30) = 2.54$, $p < .05$. Reliability of the questionnaire, calculated using the Kuder-Richardson formula 20, was .86.

The performance of the GDM group on the questionnaire demonstrated that the majority of the group knew of their potential for diabetes. They also knew that being overweight and eating a diet high in fat and sugar increased their risk of developing diabetes while exercise decreased their risk of diabetes. Stress, as a factor that may increase an individual's risk of diabetes, was less well known. Age and parity were found to be significantly negatively correlated with knowledge.

The GDM knowledge questionnaire could be used in further research, as a tool in quality assurance, and as an adjunct to clinical nursing.

DECLARATION

"I certify that this thesis does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any institution of higher education, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text."

Signature

Date

28 / 9 / 94

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CHAPTER 1

1. INTRODUCTION

1.1. BACKGROUND AND SIGNIFICANCE

Diabetes, a common health problem in the western world, is a chronic disease that cannot be cured but can be controlled. Lifestyle and a history of gestational diabetes mellitus (GDM) have both been shown to affect potential for developing non insulin diabetes mellitus (NIDDM) (Diabetes Australia, 1988; Henry & Beischer, 1991). Diabetes mellitus is significant because it is associated with increased morbidity and mortality (Australian Bureau of Statistics, 1991). Individuals with diabetes, or with an increased risk of developing diabetes who do not have knowledge of the disease are unlikely to understand its significance and are, therefore, unlikely to comply to treatment regimes (Simon & Stewart, 1976). Igoe and Giordano (1992) identified knowledge as the beginning point of disease prevention. Knowledge, they explained, can influence attitude and change behaviour.

GDM is defined as carbohydrate intolerance of variable severity with onset or first recognition in pregnancy (Metzer, 1991). The diagnosis of GDM has implications for mother and baby during pregnancy and for their futures. For women with GDM to care for themselves on a day to day basis and to reduce their risk of developing diabetes mellitus in later life, an understanding of GDM and NIDDM is necessary. Women with GDM require a thorough education that centres not only on immediate care but also on long term health implications (Howard, 1992).

Assessment by educators of individuals' knowledge of diabetes is an essential part of education (Dunn et al, 1984). Knowledge is only one of many important variables

involved in diabetes education and Dunn et al suggest that time should not be overspent on its assessment. It is necessary, therefore, to develop efficient instruments that are rapid and reliable in assessing diabetes knowledge.

1.2. THE PROBLEM

Although much work has been done to develop instruments to measure knowledge of diabetes in people with insulin dependent diabetes mellitus and NIDDM, a review of the literature failed to provide an instrument to specifically assess knowledge of GDM, diabetes mellitus and lifestyle factors that increase or decrease the risk of developing diabetes mellitus in women with GDM.

1.3. PURPOSE OF THE STUDY

The primary purpose of this study is to develop a valid and reliable questionnaire to assess knowledge of GDM, NIDDM, and lifestyle factors that increase or decrease the risk of developing diabetes in women with GDM.

Secondly, the study sought to describe the knowledge of women with GDM regarding GDM, NIDDM and lifestyle factors that increase and decrease the risk of developing diabetes.

Thirdly, the study sought to answer the following questions.

1. Is the women's knowledge related to age, race, parity, time since diagnosis, or facility through which their diabetes was managed?
2. Do women with GDM have an accurate perception of their weight?

3. Do women with GDM report that they have knowledge of diabetes that preceded their current pregnancy ?
4. If so, what are the sources of their pre-existing diabetes knowledge and was there a difference in their GDM knowledge scores related to source of pre-existing diabetes knowledge?

CHAPTER 2

LITERATURE REVIEW

2.1. INTRODUCTION

A review of literature was originally undertaken to locate an instrument designed to assess knowledge in women with GDM. Many researchers (Dunn et al, 1984; Etzwiler, 1962; Karlander, Alinder & Hellstrom, 1980; Miller, Goldstein & Nicholaisen, 1978) have assessed knowledge in children and adults with insulin dependent diabetes or NIDDM. An instrument to assess knowledge in women diagnosed with GDM and which focussed on their potential for developing diabetes in later life, however, could not be found. A subsequent literature review was undertaken to provide the rationale for the development of a questionnaire to assess knowledge in women with GDM and to validate the items for inclusion in the questionnaire.

This literature review elucidates the incidence and implications of GDM, the prevalence and significance of diabetes mellitus, and factors that increase or decrease the risk of developing diabetes mellitus. Literature which focuses on diabetes education, knowledge assessment, questionnaire development, and instrument validity and reliability is also reviewed.

2.2. GESTATIONAL DIABETES MELLITUS

Oats and Beischer (1986) describe the physiology of GDM. A number of factors influence blood sugar levels in pregnancy. Hormones cause blood sugars to rise and there is an increase in insulin resistance. These factors are counter balanced by an increase in insulin concentration. The majority of pregnant women manage to maintain their blood sugar

levels within a normal range. If the capacity for insulin secretion is exceeded, blood sugar levels cannot be maintained within normal levels and GDM develops (Grant, Oats & Beischer, 1986; Oats & Beischer, 1986). Kuhl (1991) estimates that GDM occurs in 2% - 3% of pregnancies in the western world. Research at the Mercy Maternity Hospital, Melbourne demonstrated an incidence of 4.9% (Henry & Beischer, 1991).

The initial stimulus for researchers to study GDM was generated because mothers with GDM had increased perinatal loss (Henry & Beischer, 1991). A study by Pettitt, Knowler, Baird, and Bennett (1980) demonstrated the significant increase in perinatal mortality in women with undiagnosed GDM. "Perinatal morbidity is also increased in pregnancies complicated with gestational diabetes" (Coustan, 1991 p.296). Women with GDM are at risk of fetal macrosomia resulting in difficult deliveries which may cause significant injury and trauma to mother and fetus (Gabbe, 1986; Rosas & Constantino, 1992). Other fetal morbidities include hypoglycaemia, hypocalaemia, polycythaemia, and hyperbilirubinaemia (Gabbe, 1986), asphyxia, and respiratory distress (Rosas and Constantino, 1992).

Although, according to Keen (1992), 98% of women revert to normal glycaemia in the post partum period, the diagnosis of GDM has significant long term consequences (Mestram, 1988; Oats & Beischer, 1986; O'Sullivan, 1984). The sequel is that women with GDM will experience a greater risk of developing diabetes mellitus and their offspring have a propensity to becoming obese and developing glucose intolerance in later life (Cousins et al, 1991; Rosas & Constantino, 1991; Second international workshop on GDM, 1985). In 1982, Henry and Beischer instituted a follow up study of women with GDM in Melbourne. They performed follow up screening using a 75g oral two hour glucose tolerance test

diabetes was calculated at 10%. Most of the women who developed diabetes in Henry's and Beischer's study developed NIDDM rather than insulin dependent diabetes mellitus.

Reece et al (1990, p.2) report "about 40% of all women who develop gestational diabetes will become diabetic, usually non insulin dependent within 15 years after delivery".

Henry's and Beischer's study found that age, obesity, and parity were positively associated with the subsequent development of diabetes. Country of birth was also found to influence the risk of developing diabetes. The incidence of diabetes was significantly greater in Mediterranean born and East Asian born women when compared with women born in Australia, New Zealand, the United Kingdom and Northern Europe.

There is a lack of consensus regarding criteria for diagnosis, screening, and management or treatment of GDM (Hunter, Doery & Miranda, 1990; Jarrett, 1993; Lehman, 1992). On this basis Jarrett disputes the existence of GDM and states that "GDM is no more than a special case of impaired glucose intolerance, temporarily associated with pregnancy" (p. 37). The main importance of impaired glucose intolerance in pregnancy, he believes, is as a predictor of subsequent NIDDM. The major advantage, according to Oats and Beischer (1986) of diagnosing GDM, is that it offers the opportunity to prevent diabetes or to diagnose diabetes early. Intervention in the form of follow up screening and education regarding exercise, diet, and weight control, for women with GDM, may prevent the onset of diabetes and associated complications (Henry & Beischer, 1991).

2.3. DIABETES MELLITUS

"Diabetes mellitus is the inability to metabolize glucose properly" (Dickason, Schult & Silverman, 1990 p. 508). It is a chronic disease which results in raised blood glucose concentration (Kinson & Nattrass, 1984). Diabetes mellitus manifests metabolic and vascular changes which affect virtually every organ in the body (Dickson, Schult & Silverman, 1990).

The prevalence of diabetes mellitus in the Australian population is 2 - 3% or over half a million people (Unsworth, 1993). Studies by Glatthaar, Wellborn, Stenhouse, and Garcia-Webb (1985) and Neil et al (1987) (cited in Henry and Bleischer, 1991) reveal that the incidence of diabetes mellitus is increasing. The study undertaken by Glatthaar et al was stimulated by a lack of knowledge of the prevalence of diabetes in Australia. They estimated the prevalence of diabetes from the Busselton 1981 population survey using the 1980 World Health Organizations criteria. The study population consisted of 3197 subjects who were 25 years and over and who were residents of the Busselton shire. Diabetes was diagnosed using a 75g oral ambulatory GTT. It demonstrated an increase in the frequency of diabetes since 1966. Furthermore Zimmet (1992, p. 27) states that "It is possible that the frequency of diabetes mellitus will double in Australia in the next decade".

The two most common classifications of diabetes are insulin dependent diabetes mellitus (also known as type 1 diabetes) and NIDDM (type 2 diabetes). Insulin dependent diabetes is characterized by insulin deficiency and the individual is dependent on insulin injections for life. NIDDM is characterized by insulin resistance rather than insulin deficiency. The term insulin resistance refers to the reduction in the efficiency with which insulin works in individuals with NIDDM (Borkman, 1992). NIDDM accounts for approximately 80 - 85% of persons with diabetes mellitus (Diabetes Australia, 1988).

Because NIDDM is associated with increased morbidity and mortality (Henry & Beischer, 1991), it is also associated with significant human and financial cost to individuals and the community (Unsworth, 1993). Complications associated with NIDDM include ischaemic heart disease, hypertension and cerebral vascular accident. The onset of NIDDM is insidious and hyperglycaemia may antedate the diagnosis of diabetes by 10 years which may cause irreversible pathology (Henry & Beischer, 1991). It is important for diabetes educators to take advantage of every opportunity to increase awareness of diabetes, risk factors, symptoms, and the need for early diagnosis (Unsworth, 1993).

The exact cause of NIDDM is unknown, however heredity has a strong influence and lifestyle factors including obesity, lack of physical exercise, diet, and stress are associated with the appearance of the condition (Australian Bureau of Statistics, 1991; Diabetes Australia, 1988). Knowledge of diabetes and avoidance of factors associated with the onset of diabetes mellitus may diminish the frequency and severity of NIDDM (Gabbe, 1986).

2.4. FACTORS ASSOCIATED WITH THE ONSET NON INSULIN DEPENDENT DIABETES MELLITUS

Genetics, diet, physical inactivity, and obesity are the major factors associated with the onset of NIDDM (Australian Bureau of Statistics, 1991; Non Insulin Dependent Diabetes in Mellitus the 90's, 1992). Other factors that Zimmet is reported to associate with the development of NIDDM are age, stress, intra uterine environment, race, loss of traditional lifestyle, and modernization (Non Insulin Dependent Diabetes Mellitus in the 90's, 1992).

Lungren et al (1989) undertook a prospective study of 1462 women in Sweden to correlate dietary habits with the development of NIDDM during a 12 year follow up period. The study demonstrated a significant association between increased body weight and an increased risk of developing NIDDM. Obesity, according to Borkman (1992), plays a major role in the development of NIDDM because the more overweight a person is the greater the insulin resistance. Insulin resistance is decreased by weight reduction and regular exercise (Borkman, 1992). In a prospective study of 87,253 American women Manson et al (1991) examined the association between regular vigorous exercise and the subsequent incidence of NIDDM. Vigorous exercise was described as "briskly walking, jogging, bicycling, etc long enough to work up a sweat" (Mason et al, 1991, p. 775). A reduced incidence of NIDDM was observed among women who exercised regularly compared with their sedentary peers. Exercise increases insulin sensitivity (Muchnick, 1992) and assists in weight reduction and maintenance (Manson et al, 1991). Helmrigh, Ragland, Leung and Paffenbarger (1992) used questionnaires to study the physical activity patterns of 5,990 American men who had previously attended the University of

Pennsylvania. They also concluded that physical activity is effective in preventing NIDDM and has a protective benefit for persons at high risk of developing diabetes.

Studies (Kawate et al, 1979; Zimmet, 1992) support the role of diet in the development of NIDDM. Kawate et al found that Japanese people living in Hawaii consumed twice as much fat and simple carbohydrate as Japanese living in Japan and had a significantly higher prevalence of NIDDM. Colditz et al (1992) who analyzed data from a prospective cohort of 84360 American women, found however, that the composition of diet plays only a moderate independent role in modifying the risk of NIDDM. It is diet in relation to prevention of obesity that is important (Colditz et al, 1992; Lungren et al, 1989). The most common dietary problem in Australia, according to the Australian Commonwealth Department of Health (1986), is overeating leading to overweight and obesity. A diet high in fat and sugar contributes to obesity where as consumption of complex carbohydrates and dietary fibre is likely to assist in weight control (Australian Commonwealth Department of Health, 1986). Oats and Beischer (1986) believe that dietary advice benefits women with a history of GDM. They cite a study by Sator, Schersten, Carlstrom, Melander, and Norden (1980) in which "dietary treatment of patients with impaired glucose tolerance reduced the emergence of overt diabetes by more than 50%" (Oats & Beischer, 1986, p.8).

Stress increases blood sugar levels (Chisholm, n.d.) and therefore, stress management is a factor in the long term control of diabetes. There is evidence according to Surwit and Feinglos (n.d.) that stress contributes to insulin resistance, thus provoking the disease in people who are predisposed to NIDDM. Stress can also contribute to the development of NIDDM by causing people to overeat, especially sugars and fats (Chisholm, n.d.).

2.5 CLARIFICATION OF HEALTHY LIFESTYLE CONCEPTS

The preceding review of literature has emphasized the importance of living a healthy lifestyle. The following is clarification of the concepts healthy weight, beneficial exercise, healthy diet, and stress management

HEALTHY WEIGHT

A simple method of assessing weight is body mass index (BMI) (Phillips, 1986). BMI is calculated by dividing a person's weight in kilograms by their height in meters squared ($BMI = \text{weight}(\text{kg}) / \text{height}^2(\text{m})^2$). "The healthy weight range is a BMI of 20 - 25" (Phillips, 1986 p.6).

BENEFICIAL EXERCISE

Pender (1982) recommends that for exercise to be beneficial, it should sustain the heart rate at 70 - 85% of its maximum potential for 20 - 30 minutes. It should be undertaken four or five times a week for a period of 30 - 60 minutes. Beneficial exercise includes walking briskly, cycling, and swimming.

HEALTHY DIET

A healthy diet is attained by eating a variety of foods from the five food groups: (a) bread and cereals, (b) fruit and vegetables, (c) meat and meat alternatives, (d) milk and milk products and (e) butter, oils and fat (Australian Commonwealth Department of Health, 1986). A healthy diet is high in complex carbohydrates and fibre and low in fat, added sugar and alcohol (Woolman, 1992). The amount of food eaten should be regulated to maintain a healthy weight (Australian Commonwealth Department of Health, 1986).

STRESS MANAGEMENT

Woolman (1992) describes stress as an imbalance within oneself which may be physical, emotional, or mental. To overcome stress, all dimensions of the person must be considered. Woolman includes the person's physical, emotional, behavioural, social, and mental states. Stress needs to be recognized, admitted to, and its source investigated (Unsworth, 1990). Some stress will be resolved through healthy eating, getting adequate rest, and using relaxation techniques. Vasterling, Sementilli, & Burish (1988) also discuss the benefits of exercise in reducing stress. If the stress cannot be dealt with by the individual, then assistance should be sought from health professionals, counsellors, support groups, or psychotherapists (Woolman, 1992).

2.6. DIABETES EDUCATION

The particular needs of the individual with diabetes makes diabetes education a specialized field of health education. Health education is defined by Pender (1982) as "a process that informs, motivates and helps people to adopt and maintain healthful practices and lifestyles". According to Karlander et al (1980), education provides the opportunity for patients to take responsibility for themselves. "Women with CDM are an identified group for whom education may prevent or delay the onset of overt diabetes mellitus or lead to its early detection" (Lehman, 1992 p.14). Management of diabetes requires active participation in self care behaviours in order to maintain well-being (Funnell, 1992).

There are many variables that influence a person's ability to engage in self care (Orem, 1985; Pender, 1982). These include demographic variables, perceptions, and beliefs. According to Greene, Beaudin, and Bryan (1991 p.470), the outcome of education programmes are improved by addressing "stress, psychological well-being, motivation, coping styles, social support, locus of control and health beliefs". Greene et al also believe that the efficiency and cost effectiveness of diabetes education is improved by using the principles of adult education developed by Knowles. Adults have teachable times or phases of readiness to learn (Knowles, 1980). "Studies of pregnant women have shown that they are far more open and receptive to learning new information than individuals who are in a non pregnant state" (Schroeder-Zweling, 1988 p.45). Knowles (1980 p. 53) also states that adults "engage in learning largely in response to pressures they feel from their current life situation". Iyer (1980) (cited in Spirito et al, 1990) believes that pregnancy is a time when women are motivated to protect their babies' health as well as their own and therefore, pregnancy is the most cost beneficial time to provide diabetes education and

effect behavioural change.

The diagnosis of GDM offers nurses the opportunity to educate women "to adopt a healthy lifestyle" (Lehman, 1992 p.16). Keohane and Lacey (1991) suggest that women with GDM benefit from education programmes that reinforce content, evaluate learning, and provide feedback.

2.7. KNOWLEDGE ASSESSMENT

Research on diabetes knowledge is confusing. Etzwiler and Robb (1972) found that improvement of knowledge was not accompanied by a corresponding improvement of metabolic control. Simon and Stewart (1976) acknowledge that acquisition of knowledge does not necessarily mean compliance to advice. However, it is the opinion of Karlander et al (1980) and Simon and Stewart that knowledge of diabetes is the starting point that enables people to self care. "To perform self care, the client must know what is important for health" (Dickson, Schult, & Silverman, 1990, p. 139). Before people with diabetes can care for themselves, an adequate knowledge of the disease and its management is necessary (Dunn et al, 1984; Etzwiler, 1962; Spirito et al, 1990). The more that people know about diabetes the better they undertake recommendations (Williams, cited in Miller et al, 1978). Igoe and Giordano (1992), identified three essential components in promoting health and preventing disease. These are imparting knowledge, influencing attitude, and changing behaviour. They believe each builds on the other with knowledge being the precursor.

In the past, research on diabetes knowledge has suffered as a consequence of poor standardization of instruments and the lack of reporting instrument validity (Dunn et al,

Spirito et al (1990) found that pregnant women with diabetes had been largely overlooked in the development of instruments to measure knowledge of diabetes. Assessment of knowledge in these women is particularly important as the disease not only affects the women themselves but also their babies (Spirito et al). Spirito et al developed the Diabetes in Pregnancy Knowledge Screen (DPKS). There were three versions of this questionnaire as it tested knowledge in pregnant women with insulin dependent diabetes, NIDDM, and GDM. Items in the test for women with GDM included exercise, sick day rules, diet, normal blood sugar range, pathophysiology of GDM, and GDM as a risk factor for developing diabetes in later life. The DPKS focussed on assessing knowledge related to management of diabetes in pregnancy. It did not focus on behaviours that have been identified as increasing or decreasing the risk of developing NIDDM and therefore differs from the questionnaire developed in this study. Women with GDM obtained a low score on the DPKS. Spirito et al attributed this to the fact that women with GDM are required to integrate a large amount of knowledge in a short period of time. Women with GDM therefore require additional educational support. Ammon-Gaberson (1987) discusses the positive effect that feedback and recognition of the acquisition of new knowledge has on the adult learner. Questionnaires afford the opportunity to provide women with GDM additional support in the form of feedback and the recognition of acquired knowledge.

2.8. QUESTIONNAIRE DEVELOPMENT

"A questionnaire is a printed self report form designed to elicit information that can be obtained through written responses" (Burns & Grove, 1987, p.311). The purposes of knowledge assessment questionnaires include gathering data to measure effectiveness of educational programmes, assisting in designing and implementing education programmes

(Sudman & Bradshaw, 1982) and assisting in identifying individuals' knowledge deficits. "Determining respondents' lack of knowledge of specific issues is crucial to understand how to change behaviour" (Labaw, 1980 p.88). Other methods that may also be used in the evaluation process and in the collection of information include check-lists, patient progress notes, laboratory assessments, verbal questioning, and direct observation (Pender, 1982).

Questionnaires are useful in various situations. For example, when information is to be collected from a large number of people, when respondents are widely dispersed, or when respondents require security of anonymity. They are also useful if there is insufficient time or resources available to use other methods for collecting information (Deschamp and Tognolini, 1983). Increasing demands on the time of the diabetes team of the participating hospital stimulated interest in developing a questionnaire to assess knowledge in women with GDM. Questionnaires can be quick and easy to administer and provide access to information such as an individual's lifestyle, that is not readily observable. However, if respondents are reluctant to divulge information or if they interpret questions differently from the way the researcher intended, the questionnaire or individual questions can be invalid.

Labaw (1980) discusses four layers of questionnaire structure vital to the development of questionnaires. They are hypotheses, questions, format, and words. Hypotheses are the beginning points, providing the reason for questionnaire development. They guide the formulation of the questionnaire, ensuring the researcher remains focussed on its purpose and the population for which it is being developed. Hypotheses are developed from previous research and from the researchers own experiences. In this study, the experiences of the researcher stimulated interest in assessment of knowledge in women with GDM and initiated the purpose and development of the questionnaire. The purpose of the

questionnaire developed in this study is to assess knowledge in women with GDM as outlined in the methodology section of this thesis.

Once the purpose of the questionnaire is clearly identified, questions are developed. The researcher must decide on the item content of the questions and this will relate to the purpose of the questionnaire. The format of the questions must be decided, whether to use open ended questions, closed or multiple choice questions. The advantages and disadvantages of each type of question were considered for this study. The advantages of open questions are that they allow the respondent expression of views which provide the researcher with richer information. They also permit the respondent to clarify answers and allow the researcher to assess the respondents depth of understanding regarding issues. Responses to open questions are also more likely to be lengthy, more difficult and more time consuming to analyze and score. Closed questions on the other hand require short answers that are generally easy to analyze. The disadvantage of closed questions is that the researcher has no way of knowing how much the respondent really understands (Labaw, 1980). A variety of question formats have been used to assess knowledge of diabetes. However, Dunn et al (1984 p.37) state "multiple choice items are most popular". With this recommendation and for ease of scoring and analysis, closed questions providing multiple choice answers were chosen as the question format when developing this questionnaire.

Good quality questions are clearly worded, comprehensible to every participant, only ask for appropriate information, and should not influence the participant to answer in a certain way. Wording of questions is crucial. Language and vocabulary must be appropriate to the research population (Shelly, 1984). Words should not be ambiguous or have complex meanings and technical terms and jargon, such as those used in medicine and nursing, should be avoided. A particular effort was made in this study to avoid medical and nursing

terms because, although the questionnaire focussed on the medical condition, diabetes, it was presumed that the participants had no previous medical or nursing knowledge.

Questionnaire format must also be taken into account. Sudman and Bradburn (1982) provide a 17 point check-list to consider when designing a well formatted questionnaire. They emphasize the importance of the questionnaire's appearance, clear print, clear directions, and uncrowded questions. The flow of the questionnaire should be logical and allow for ease of answering. The length of the questionnaire will depend on its type and purpose. However, very long questionnaires often result in a low response rate (Deschamp & Tognolini, 1983). Self administered questionnaires should require no more than 30 minutes to complete (Goode & Hatt, 1952). These principles guided the design of the questionnaire format in this study.

2.9. VALIDITY AND RELIABILITY

Before an instrument is used for research, validity and reliability should be established (Burns & Grove, 1987). Anastasi (1988), Burns and Grove, and Carmine and Zeller (1989) discuss three types of validity: content, criterion related, and construct validity. "Content validity verifies that the method of measurement actually measures the expected content. "This type of validity is very important in knowledge testing" (Burns & Grove, 1987 p. 86). Content validity involves the systematic examination of the contents of the instrument to determine whether it covers a representative sample of the domain to be measured (Anastasi, 1988). A method of establishing content validity is to submit the tool to experts in the particular field for their evaluation of its content. The experts provide comments and suggestions that lead to further development and refinement of the tool and thus establishment of validity.

"Criterion-related validation procedures indicate the effectiveness of a test in predicting an individual's performance in specified activities" (Anastasi, 1988, p.145). There are two kinds of criterion related validity, predictive and concurrent. "Predictive validity determines the effectiveness of the instrument as a predictor of a future event" (Burns & Grove, 1987 p. 295). Tests used in personnel selection, such as hiring job applicants require predictive validity. "Concurrent validity is the ability to predict the current value of one measure based on the measure of another concept" (Burns & Grove, p. 295). "Tests are administered to a group on whom criterion data is already available." (Anastasi, 1988 p.146). Burns and Grove (p. 295) suggest as an example of concurrent validity that "one might be able to predict the self-esteem score of an individual who had a high score on an instrument to measure coping".

"Construct validity is considered the most important type of validity to examine. Construct validity is the degree to which a measurement strategy measures the construct it was designed to measure "(Burns and Grove, 1987, p. 296). Burns and Grove discuss several steps and approaches to establishing construct validity. The contrasted groups approach uses two sample groups who are expected to have differing responses to the items in the instrument. Their responses are analyzed using a statistical procedure such as a t-test. If the groups' responses are significantly different, as expected, evidence is added to the instruments validity.

Choosing an appropriate validation method depends on what use is to be made of the test results. Because an appropriate questionnaire to assess knowledge in women with GDM has not been developed, no criterion is available with which to compare the GDM knowledge questionnaire developed in this study. Furthermore, the existence of such a questionnaire would negate the need for this study. Thus criterion related validity is not

appropriate to this study. The establishment of content validity, however, has been identified by Burns and Grove (1987) as being important for knowledge assessment instruments. Establishment of construct validity is also appropriate to this study as it establishes to what degree the questionnaire measures knowledge of GDM, NIDDM, and lifestyle factors associated with the onset of NIDDM.

Finally, reliability of the questionnaire needs to be considered. Anastasi (1988) examines the principle techniques for measuring reliability. Kuder-Richardson reliability is the most common procedure for establishing reliability when utilizing single administration of a single test and where the items of the test are scored right or wrong as in this study. Kuder-Richardson reliability is based on consistency of all responses to all items in the test. It examines performance on each and establishes interitem consistency. The formula used in this study was the Kuder-Richardson formula 20.

2.10. SUMMARY

This review of literature has identified that GDM occurs in 2% - 4.9% of pregnancies in the western world. Women with a history of GDM have a significantly increased risk of developing NIDDM in later life. NIDDM is associated with increased morbidity and mortality. Lifestyle factors, obesity, exercise, diet, and stress, were identified as affecting the risk of developing NIDDM.

Diabetes education provides the opportunity for individuals with diabetes to take responsibility for themselves and to participate in self care. Pregnancy was identified as a time when women are receptive to learning new information. Knowledge was recognized

as being essential to enable individuals to self care. Knowledge assessment provides the opportunity for nurses to acknowledge the individual's acquisition of knowledge, to identify knowledge deficits, and provide feedback. Women with GDM have been largely overlooked when developing questionnaires to assess knowledge of diabetes.

The literature provided guidelines for developing questionnaires and establishing the questionnaire's validity and reliability.

CHAPTER 3

CONCEPTUAL FRAMEWORK

Successful management of diabetes relies on the individual engaging in self care (Glasgow et al, 1989; Rosas & Constantino, 1992; Simon & Stewart, 1976; Spirito et al, 1990). The conceptual framework that informs this study is Orem's general theory of nursing (1985). According to Rosas and Constantino (1992) Orem's theory is particularly well suited to women with GDM and has been adapted by nurses such as Fitzgerald (1980) and Keohane & Lacey (1990).

Orem's general theory of nursing consists of three related theories; the theory of self care, the theory of self care deficit and the theory of nursing systems. Orem (1985 p.84) defines self care as "the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health and well-being." Individuals that engage in self care know about themselves and the care they need. If women with GDM are to self care, they need to know about GDM and their potential for developing NIDDM. Orem asserts that when self care is not maintained, illness, disease or death will occur. Women with a history of GDM who do not practice self care increase their potential for illness and disease in the form of NIDDM and complications associated with diabetes.

Self care occurs when individuals engage in actions to care for themselves. These actions are described by Orem (1985) as self care requisites. "Self care requisites must be known before they can serve the purpose of self care" (Orem, 1985 p. 86). Orem identifies three types of self care requisites; universal, developmental, and health deviation. Universal self care requisites include (a) maintenance of sufficient food intake, (b) balance of activity and rest, (c) prevention of hazards to human life, functioning, and well-being and (d)

promotion of human functioning and development. "Developmental self care requisites are either specialized expressions of universal self care requisites that have been particularized for the developmental process or they are new requisites derived from a condition (e.g. pregnancy)" (Orem, 1985 p.95). Individuals diagnosed with a disease take on additional self care requisites known as health deviation requisites. Health deviation requisites include (a) seeking and securing appropriate medical advice, (b) being aware of, and attending to pathological conditions and states, (c) effectively carrying out therapeutic measures specific to illness, and (d) accepting one's state of health and need for specific care.

Self care requisites of women with GDM include being aware of GDM, NIDDM and their implications, accepting the diagnosis and the potential for NIDDM, and accepting the need for specific actions to prevent NIDDM. The literature identified actions (self care requisites) that are associated with the prevention of NIDDM and diabetic complications. These include maintenance of healthy weight, maintenance of a healthy diet, maintenance of regular exercise, and management of stress.

When self care requisites are met Orem (1985) suggests that (a) life processes are supported, (b) human structures and functions are maintained within a normal range, (c) there is contribution to regulation or control of injury and pathology, (d) there is contribution to cure or regulation of pathological processes, and (e) general well-being is promoted. Effectively meeting universal and developmental self care requisites in well individuals results in primary prevention of disease and promotion of well-being. Satisfaction of health deviation self care requisites is directed towards secondary and tertiary prevention of disease such as control of underlying pathology and prevention of

complications (Frey and Denyses, 1989). If women with a history of GDM effectively meet their self care requisites the onset of NIDDM may be prevented or delayed. To perform self care, knowledge, motivation, and skill are required. Performing self care involves making choices about what should be done and how it should be done.

"Knowledge of human functioning, one's present condition and circumstances and known care measures provide a basis for such reflection " (Orem, p. 88).

Self care deficits arise when an individual's capabilities (self care agency) do not meet the actions required to meet self care requisites (therapeutic self care demand) (Orem, 1985). The theory of self care deficit prescribes when nursing intervention is needed (Foster & Janssens, 1990).

In her theory of nursing systems, Orem (1985) describes nursing as a helping service that assists individuals to develop their self care agency. "Self care agency is a complex acquired ability" (Orem, 1985 p.105) and is influenced by age, health, life experiences, education, and culture. Nurses determine the adequacy of individual's self care agency, identify self care deficits, and implement nursing to assist achievement of self care. Nursing according to Orem, involves a three step process which assesses the individual, designs nursing systems, and initiates, conducts, and controls actions of assistance. The first step of the process is "an investigative operation" (Orem, 1985 p. 225), in which nurses assess the individuals needs and identify self care deficits. In this phase, Orem suggests that nurses ask five questions. They include "What is the patient's therapeutic self care demand? Now? At a future time?" and "Does the patient have a deficit for engaging in self care to meet the therapeutic self care demand?" (Orem, 1985 p.225). This process is on-going and investigations require "that nurse have effective ways and means to secure ...

essential information" (Orem, 1985 p. 226).

The literature and Orem (1985) have identified that knowledge is a factor that influences the ability to self care (self care agency) and, therefore influences the practice of self care. As part of the nursing process, nurses investigate individuals' self care agency and their knowledge of actions required to self care (self care requisites). This study was undertaken to provide an effective method, a questionnaire, to assess knowledge in women with GDM regarding GDM, NIDDM and lifestyle factors that influence the risk of developing NIDDM in later life.

In summary, Orem (1985) asserts that self care is necessary to maintain health and well-being. Self care is a learned behaviour. The ability to self care (self care agency) is influenced by a number of factors, one of which is knowledge. It is the role of nurses to assist individuals to self care. This requires nurses to assess individuals' self care agency, identify self care deficits, such as knowledge deficits, and to implement nursing action to assist the individual to self care. Effective methods for assessment are required. The literature failed to reveal an appropriate instrument to assess knowledge in women with GDM and thus provided the impetus for this study.

CHAPTER 4

4. METHODOLOGY

4.1. DESIGN

A methodological design was used in this study to develop a questionnaire to assess diabetes knowledge in women with GDM and to provide evidence of the questionnaire's validity and reliability. Burns & Grove (1987) define methodological studies as "designed to develop the validity and reliability of instruments "(p. 277).

4.2. SETTING

The study was conducted in a hospital for women in Perth, Western Australia. The hospital is a major teaching hospital for obstetrics and gynaecology and is a tertiary referral centre for the state. It has 250 beds.

Statistics kept by the diabetes educator at this hospital revealed that the incidence of GDM is 5% amongst the hospital's antenatal population. The statistics also demonstrated that the number of women with GDM and the total number of women attending the diabetes clinic have been increasing (see Figure I). The hours available and the staff employed in the diabetes clinic however, had not increased. This increase in attendance to the diabetes clinic promoted the implementation of alternative methods of teaching (e.g. videos) and the sharing of diabetes management with other clinics and doctors. As a result, women with GDM, now experience less personal contact and teaching with the diabetes educator. This reduction in personal contact also makes it more difficult for the diabetes educator to assess the women's knowledge and educational needs.

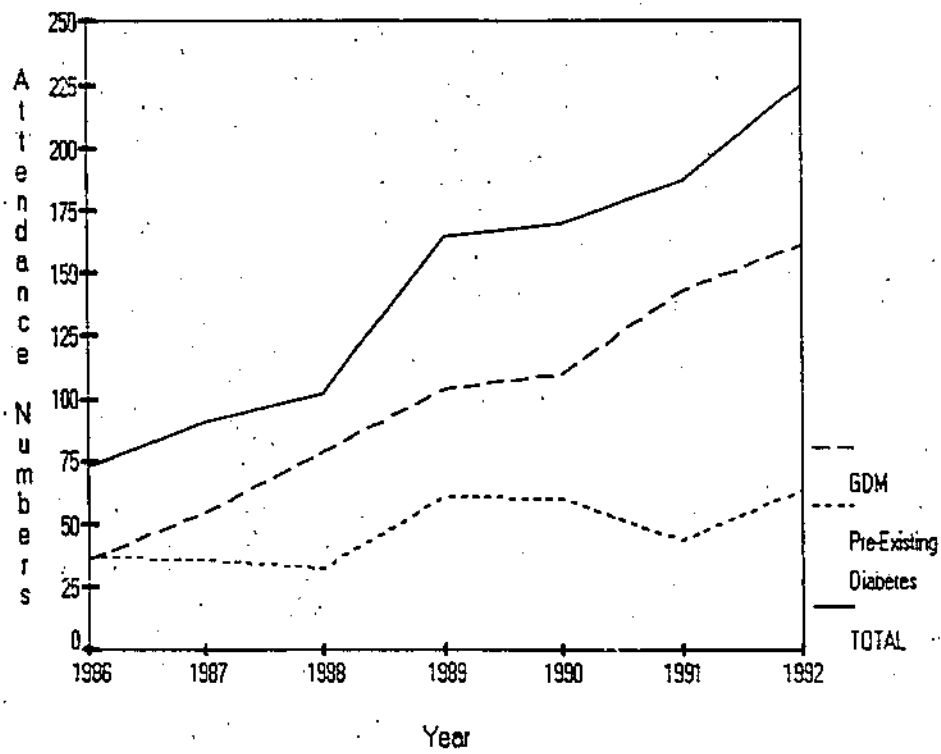


Figure 1 Attendance at the Diabetes Clinic, 1986 - 1992

4.3. INSTRUMENT

The rationale for the development of the questionnaire was generated from the literature and Orem's general theory of nursing (1985). The development of the questionnaire involved the following steps.

1. Clarification of reason for and purpose of questionnaire.
2. Item development.
3. Determination of format.
4. Examination of content validity.
5. Analysis of construct validity.
6. Calculation of reliability.

This chapter outlines the process in each of the above steps.

4.3.1. REASON FOR AND PURPOSE OF THE QUESTIONNAIRE

With the increase in the number of women with GDM and in the number of women attending the diabetes clinic, new methods were required to assess the knowledge of women with GDM. The reason for developing the GDM knowledge questionnaire was to provide a quick and reliable method of identifying knowledge deficits related to GDM, NIDDM and lifestyle factors associated with the risk of developing NIDDM.

The purpose of the GDM knowledge questionnaire is to assess knowledge in a population of women diagnosed with GDM regarding the following questions.

Do women who have been diagnosed with GDM :

1. know what diabetes is ?
2. know they have an increased risk of developing diabetes mellitus?
3. know what lifestyle factors increase or decrease the risk of developing diabetes mellitus?
4. know the signs and symptoms of diabetes mellitus?
5. know the implications of having diabetes mellitus?
6. know what community resources are available?
7. know strategies that assist in living a lifestyle associated with reducing the risk of developing diabetes mellitus?

The GDM knowledge questionnaire will enable identification of knowledge deficits and provide the opportunity for immediate feedback and patient specific education. The questionnaire assesses knowledge of self care requirements which Orem (1985) terms self care requisites. These self care requisites are specific to women with a potential for developing NIDDM, such as women with GDM.

4.3.2. ITEM DEVELOPMENT

With the purpose of the questionnaire now clearly defined, items for questions were drawn from the diabetes education programme of the participating hospital. A review of the literature was undertaken to validate the items. Twenty six items were developed to assess women's knowledge of GDM, NIDDM, and lifestyle factors associated with influencing the risk of developing NIDDM.

The questionnaire also sought demographic information from the participants and twelve

questions were developed to:

1. Determine the participants' age, parity, and gestation which enabled the matching of the two groups of women for the process of establishing construct validity.
2. Ascertain the participants' perception of their weight to determine if it was a accurate perception. An obese or underweight woman who perceives her weight as being healthy may not engage in behaviour appropriate to achieving a healthy weight. Conversely, women in a healthy weight range need confirmation that their perception is correct and need encouragement to maintain a healthy weight. An individual's weight was identified in the literature as affecting the risk of developing NIDDM. It was also necessary, therefore, to determine each participant's weight and height.
3. Identify the race of each participant.
4. Determine if the participants perceived that they had knowledge of diabetes that preceded their current pregnancy and to verify the source of their diabetes knowledge. It was assumed that knowledge that preceded the current pregnancy may influence the participants' ability to answer the questions. Furthermore, pre-existing diabetes knowledge may influence the process of establishing construct validity.
5. Discover the facility through which the diabetes was assessed and managed.
6. Ascertain gestation at diagnosis of GDM.
7. Determine if participants had been diagnosed with gestational diabetes in a previous pregnancy.

4.3.3. FORMAT

Questions were designed for a population of women who had been diagnosed with GDM and who had received diabetes education. The questionnaire (Appendix A) had two sections. The first (Section A), elicited demographic information from the participants and consisted of 12 closed questions which provided either multiple choice answers or provided a space in which to write a one word answer. The second section (Section B) was a knowledge test which consisted of 26 closed questions with multiple choice answers.

Questions 1 to 5 elicited knowledge regarding what diabetes is and implications of GDM. Questions 6 to 17 established the respondents' knowledge of factors that increase the risk of developing diabetes. Four questions in this group of questions asked what effect smoking and high blood pressure have on the risk of developing NIDDM. The literature reviewed did not associate smoking and high blood pressure with an increased risk of developing NIDDM. These questions were included as distractor questions to further test the women's knowledge. Questions 18 and 19 asked about signs and symptoms and complications of diabetes mellitus. Question 20 asked about the community resources available to individuals with diabetes. Questions 21 to 26 asked about specific behaviours that are associated with living a healthy lifestyle and are associated with lowering the risk of developing diabetes mellitus.

Questions were constructed to provide consistency of format. As in other studies (Dunn et al, 1984; Spirito et al, 1990) "I don't know" was offered as an answer option to try to prevent guessing.

Clearly printed directions were provided at the beginning of each section. Where possible

medical terms were avoided and an attempt was made to use simple language. The questionnaire was designed to take approximately 20 to 30 minutes to complete.

4.3.4. CONTENT VALIDITY

As suggested in the literature, content validity was established by submitting the questionnaire to a panel which consisted of two diabetes educators, who are also midwives, two dietitians, an obstetrician/gynaecologist, and a physician, all of whom are involved with care of women with GDM. The questionnaire was also submitted to a biostatistician.

The panel scrutinized the contents of the questionnaire to determine :

1. whether the questions posed would assess knowledge.
2. that each item to be assessed was equally weighted.
3. that the questions and language were appropriate to the population.
4. whether there were any areas not in the questionnaire that they considered important to include.

The questionnaire underwent gradual transformation and refinement during this process of developing content validity. There were a number of areas that required refinement.

Suggestions were given to simplify wording and to be consistent with wording, for example using "sugar" instead of "glucose" and not interchanging the words "sugar" and "glucose". The format of the questions was altered so that questions did not provide clues or pre-empt answers to other questions. The panel ensured that questions remained focussed on items covered in the diabetes education programme. They also ensured that questions did not provide misleading information. For example, a question on stress originally asked what influence stress had on the risk of developing diabetes. Stress on its

own is unlikely to cause diabetes, however, if a person is already at risk of developing diabetes (eg has a history of GDM), stress may trigger its onset (Surwit & Feinglos, n.d.). The question was rewritten to ask what influence does stress have on the risk of developing diabetes *in women with GDM*.

4.3.5. CONSTRUCT VALIDITY

In this part of the study, questionnaire performance or scores were compared from two groups of women. One group consisted of women diagnosed with GDM who had received diabetes education at the participating hospital (GDM group). The other group of women were attending the same hospital for antenatal care but *did not* have GDM (non GDM group) and *had not* received diabetes education at the hospital.

If the questionnaire assessed knowledge, as intended, then the GDM group would achieve higher scores in the questionnaire than the non GDM group. If the questionnaire did not assess knowledge, then there would be no significant difference in scores between the two groups.

Burns and Grove (1987) described this method as the contrasted groups approach to establishing construct validity.

4.3.5.1. *SAMPLE*

A convenience sample was selected from the antenatal clinics and diabetes clinic of the participating hospital. The two groups of women were matched for age, parity and, where possible, gestation. Only women who spoke and read English were selected.

Possible participants in the GDM group were identified from records kept by the hospital's diabetes educator. The women were either currently pregnant or had delivered their babies in the last 2 months. The women in the GDM group had received diabetes education from the diabetes educator and the dietitian. If circumstances allowed, the women were educated away from the clinic, either individually or in small groups of up to four. The education sessions provided information on insulin dependent diabetes, NIDDM and GDM. The pathophysiology and implications of GDM were discussed. Strategies for preventing NIDDM were presented. If prescribed by the medical officer, self blood glucose monitoring was taught and continued at home. The dietitian provided dietary advice. Education sessions took approximately one and a half to two hours. Further antenatal care and diabetes management may have been undertaken at the diabetes clinic, the antenatal clinic of the participating hospital, antenatal clinics at other hospitals, by private doctors or a combination of these facilities. It was expected that women who attended the diabetes clinic had the opportunity for continuing education with the diabetes educator whereas women attending other facilities had limited ongoing contact with the diabetes educator. The study therefore sought to answer the question, is diabetes knowledge related to the facility through which the diabetes was managed?

Following the identification of possible participants for the GDM group, a second group of

women, the non GDM group, was selected from the antenatal clinics of the participating hospital. While women waited in the antenatal clinic for their routine visits, the researcher reviewed available antenatal files noting the women's birth dates, expected dates of delivery, and parities. Each woman in the non GDM group was selected because she matched a woman in the GDM group for age, parity, and gestation.

4.3.5.2. PROCEDURE

THE GDM GROUP

Fifty one women were identified from the records of the diabetes educator as possible participants in the GDM group. An attempt was made to contact all these women and invite them to participate in the study. Due to the time constraints of the study and because some of the eligible women were no longer attending the participating hospital, three methods were used to invite women in this group to participate.

1. The researcher personally approached 21 women at the diabetes clinic, at the antenatal clinic, and on the postnatal wards, described the study and asked the women to complete the questionnaire. Twenty women (95%) agreed to participate and returned completed questionnaires.
2. The researcher attempted to contact a further 20 women by telephone. Two of the women had moved and were unable to be contacted. Eighteen women were contacted, the study was described and permission was requested to send them a questionnaire. All those contacted agreed to having the questionnaire mailed to them and 11 (55%) were returned. One questionnaire was returned to sender because there was an error in the address. Six questionnaires were not returned to the researcher.

3. The researcher wrote to 4 women, for whom she did not have telephone numbers, explaining the study and requesting their participation. One questionnaire was returned unopened and the three remaining were not returned.

Altogether 43 questionnaires were distributed to women who had been diagnosed with gestational diabetes and thirty one (71%) were returned.

THE NON GDM GROUP

Identification of possible participants in the non GDM group is described in the sample section of this thesis. The researcher approached women as they waited in the clinic for their routine antenatal visit and invited them to participate in the study. These women had not been diagnosed with GDM in their current pregnancy and had not received diabetes education at the participating hospital. Thirty one questionnaires were distributed in this manner, were completed and returned to the researcher before the women left the clinic. This resulted in there being 31 matched pairs.

4.3.5.3. SCORING

A code was developed to score answers in the demographic section of the questionnaire (Appendix E). The 26 questions in the knowledge section of the questionnaire (Section B) were marked as either correct or incorrect. A correct answer received a score of one. An incorrect answer or an "I don't know" answer received a score of zero. Questions 18 to 20 and 22 to 26 had more than one correct answer, however, the highest possible score for each question was one mark. Therefore, a guide for marking was developed (Appendix E) which provided the criteria for gaining each mark. The highest possible score on the knowledge questionnaire was 26.

4.3.5.4. DATA ANALYSIS

A paired t-test was performed on the total scores from the two groups to determine if the questionnaire does assess diabetes knowledge as intended. The results of this comparison are shown in Chapter 5

4.3.6. CALCULATION OF RELIABILITY

Reliability of this questionnaire, calculated using the Kuder-Richardson formula 20, was .86. This establishes interitem consistency and, thus, instrument reliability.

4.4. ETHICAL CONSIDERATIONS

Approval to undertake this study was granted by the ethics committees of Edith Cowan University and the participating hospital.

Participants approached by phone and in person received verbal explanation of the study and received a printed information/consent form (Appendix B). Women contacted by mail received a letter of explanation (Appendix C or D) and an information/consent form. The information sheet explained briefly what GDM is so that even the non GDM group knew that GDM was diabetes that developed in pregnancy. The information sheet also provided information about the study and explained the purpose of the participant's involvement. The right to refuse participation was explained a confidentiality and anonymity were assured.

4.5. SUMMARY

Using a methodological design, a 26 item knowledge questionnaire was developed to provide a quick method to assess diabetes knowledge in a population of women with GDM. Twelve questions were also developed to elicit demographic information from the participants. The rationale for the development of the knowledge questionnaire was generated from the literature and Orem's general theory of nursing (1985). The items in the questionnaire deal with self care requisites of women with GDM. Content validity was established by health professionals involved with caring for women with GDM and a biostatistician. A contrasted groups approach was used to establish evidence of construct validity. Reliability of the questionnaire was calculated using the Kuder-Richardson formula 20.

CHAPTER 5

RESULTS

The GDM knowledge questionnaire was developed to assess knowledge in women who have been diagnosed with GDM. In the process of validating the questionnaire, 31 women who had been diagnosed with GDM and 31 women who were not diagnosed with GDM completed the GDM knowledge questionnaire. Demographic information about the participants of these two groups is presented. The performance on individual questions of the GDM group and non GDM group is displayed in figure 2. A paired t-test was performed on the total scores from the two groups to provide evidence of the questionnaire's validity. Those results are presented and discussed in this chapter. The performance of the women in the GDM group on the questionnaire is also discussed and their knowledge scores are analysed in relation to demographic variables.

DEMOGRAPHIC DATA

Section A of the questionnaire sought demographic details from the participants. Table 1 compares the ages, parities and weights of women in the GDM and non GDM groups.

Table 1**Demographic Data of Women With GDM**

	Mean	SD	Min	Max	N
Age in Years	30.65	6.71	19.00	47.00	31
Parity	1.35	1.56	00	6.00	31
Gestation	0.97	1.25	00	5.00	31
Weight in Kilograms	55.53	9.04	42.00	85.00	31
BMI	28.01	7.02	18.97	47.74	
Gestation at Diagnosis in Weeks	27.94	7.11	10.00	37.00	
Duration of disease in weeks	7.77	5.36	1.00	22.00	

Paired t-tests were performed to compare the ages and to compare the parities of the women in the GDM and non GDM groups. There was no significant difference in the age of women in the GDM group ($M = 31.5$) and the age of women in the non GDM group ($M = 30.6$), $t(30) = 1.88$, $p > .05$. There was no significant difference in the parities of the women in the GDM group ($M = .94$) and the women in the non GDM group ($M = .77$), $t(30) = 1.98$, $p > .05$. These calculations show that the GDM and non GDM groups were matched for age and parity.

Because weight was identified as a risk factor for developing diabetes, a paired t-test was

performed to analyze the weights of the women in the two groups. The weight of the women in the GDM group ($M = 70.76$) was significantly higher than the weight of the women in the non GDM group, ($M = 55.53$), $t(30) = 4.77$, $p < .001$.

Where possible the two groups were matched for gestation. Sixteen women in the GDM group were pregnant when they completed the GDM questionnaire and were matched with pregnant women in the non GDM group. Table 2 compares the gestations of these two groups of women.

Table 2

Comparison of Gestations of Women in GDM and non GDM groups

	Mean	SD	Min	Max	N
GDM group	33.19	6.22	16.00	40.00	16
non GDM group	31.88	7.08	19.00	42.00	16

Fifteen women in the GDM group had delivered their babies at the time of completing the questionnaire. The babies ages ranged from 3 days to 10 weeks. These women were matched with women in late pregnancy from the non GDM group. The gestation of these women, in the non GDM group, ranged from 34 weeks to 42 weeks. Ten of the women were 38 weeks gestation or more.

Race was identified, in the literature, as being a risk factor in the development of diabetes. For example, women of Aboriginal and Asian descent have been identified as being at higher risk than women of European descent (Zimmet, 1992). Table 3 shows the race indicated by the women in the GDM and non GDM groups.

Table 3**Race Indicated by Participants**

Race	GDM group	Non GDM group
European	14	21
Aboriginal	3	1
Asian	7	4
Australian	5	2
unknown	2	0
other	0	3

other = Persian

 Chilean

 New Zealander

It is interesting to note that 33.3 % of the GDM group indicated that they are of Aboriginal or Asian descent while 16.6% of the non GDM group were of Aboriginal or Asian descent.

Both groups of women were asked if they had any knowledge of diabetes prior to their current pregnancy. Table 4 shows the women's perception of their pre-existing diabetes knowledge.

Table 4**Women's Perception of Diabetes Knowledge prior to this Pregnancy**

	GDM Group	Non GDM Group
nothing	10	7
a little	14	21
quite a lot	4	2
a lot	3	1

This table shows that the majority of women in both groups knew at least a little about diabetes prior to their current pregnancy.

The women who indicated that they had pre-existing diabetes knowledge, were then asked to identify their source of pre-existing diabetes knowledge. Table 5 shows the sources of pre-existing diabetes knowledge and the number of women who indicated that they gained knowledge from each source.

Table 5**Source of Diabetes Knowledge that Pre-existed this Pregnancy**

	GDM group	Non GDM group
relative/close friend	15	11
Previous GDM education	2	0
reading	10	12
TV	1	3
family doctor	2	1
other	3	5

Seven women in the GDM group and 5 women in the non GDM group indicated that they had gained knowledge about diabetes from more than one of the above mentioned sources. Source of pre-existing diabetes knowledge is related to the knowledge scores of women in the GDM group later in this chapter.

COMPARISON BETWEEN GROUPS

To examine the questionnaire's construct validity, a paired t-test was performed on the total scores from the two groups. The score of the GDM group ($M = 15.9$) was significantly higher than the non GDM score ($M = 12.4$), $t(30) = 2.54$, $p < .05$. It is concluded that the questionnaire does assess knowledge as intended and, therefore evidence of construct validity is provided. The performance of the two groups of women on individual questions is displayed in Figure 2.

Questions 1 to 6, questions which tested knowledge about what diabetes is and the implications of GDM and Questions 12 to 15, which asked about the influence of diet and exercise on the risk of developing diabetes, demonstrate the greatest difference in knowledge between the two groups, with the GDM group achieving higher scores. These topics are discussed as part of the diabetes education programme of the participating hospital. The scores on Questions 7 - 11 and 16 and 17, which were about weight, stress, smoking, and high blood pressure were very similar in both groups. The GDM group's score was also better on Questions 18, 19, 23, and 25. These questions asked about signs and symptoms of diabetes, complications associated with diabetes, strategies for lowering stress, and ways to reduce fat in the diet. Once again, this information is provided as part of diabetes education. Questions 20 - 22, 24 and 26 were answered

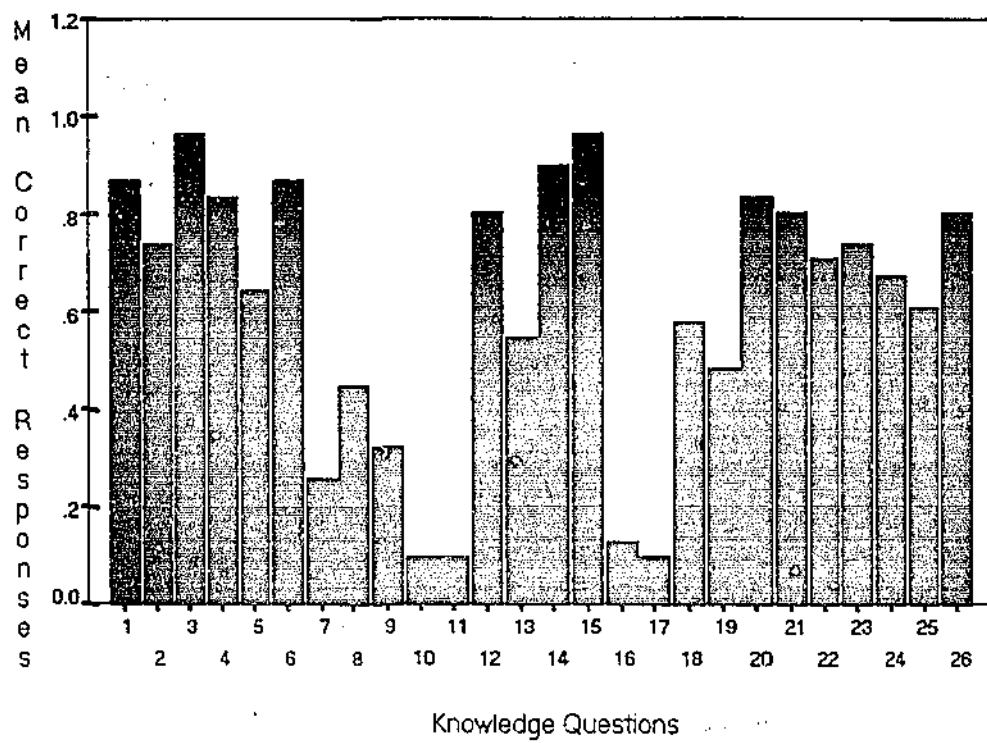


Figure 3 GDM group's performance on the GDM Knowledge Questionnaire

similarly by both groups. These questions dealt with recommendations about exercise, a healthy diet and strategies to maintain a healthy weight. These topics have received recent media exposure in programmes such as "Life be in it" and this may account for the similar good scores achieved by both groups of women.

INFORMATION ABOUT THE GDM GROUP

The GDM knowledge questionnaire was developed for women with GDM. This study sought to describe the knowledge of women with GDM. Information about the GDM group, gained from the questionnaire, is now presented.

Table 6 presents demographic data from the GDM group related to their gestation at the time of diagnosis of GDM and time since diagnosis of GDM. Time since diagnosis of GDM was calculated by subtracting gestation at the time of diagnosis from the gestation at the time of completing the questionnaire or gestation at delivery.

Table 6

Gestation at Diagnosis of GDM and Time Since Diagnosis of GDM

	Mean	SD	Min	Max	N
Gestation at diagnosis in weeks	27.94	7.11	10.00	37.0	31
Time in weeks since diagnosis of GDM	7.77	5.36	1.00	22.0	1

Table 6 demonstrates that women were diagnosed with GDM as early as 10 weeks gestation as late as 37 weeks gestation. The time since diagnosis ranged from one week to 22 weeks.

solely through the diabetes clinic. Women in the GDM group were therefore asked to indicate through which facility their diabetes was managed or assessed. The purpose of this question was to ascertain if there was a difference in the women's knowledge scores related to the facility through which their diabetes was managed. Table 7 indicates how women answered this question.

Table 7

Facility Through which Diabetes was Managed

Antenatal clinic (ANC) (participating hospital) only	6
Diabetes clinic	11
ANC, (participating hosp.) + Diabetes clinic	2
Diabetes clinic + ANC (another hospital)	7
Private doctor only	3
Diabetes clinic + private doctor	1
<u>ANC (participating hosp),ANC (another hosp) + doctor</u>	<u>1</u>

It was not anticipated that there would be such a variety of answers to this question.

Knowledge scores of the GDM group are analyzed in relation to facility through which their diabetes was managed or assessed later in this chapter.

The purpose of the GDM knowledge questionnaire was to assess knowledge of GDM, NIDDM, and lifestyle factors that increase or decrease the risk of developing diabetes in women with GDM. Figure 3 illustrates the GDM group's performance on the knowledge section (Section B) of the Questionnaire. Scores ranged from 2 - 22 from a possible score of 26.

Answers to Questions 1 to 5 demonstrated that more than 60% of women in the sample knew what diabetes is and knew the implications of GDM. More than 80% knew that GDM increased the likelihood of developing diabetes in later life. Questions 6 to 17 established the respondent's knowledge regarding factors that increase the risk of NIDDM. More than 80% of the women knew the implications, in relation to the risk of developing diabetes, of being overweight, of exercising, and of eating a diet high in fat and sugar. Less than 50% however, knew that stress, with a history of GDM, may increase the likelihood of developing diabetes. Furthermore, less than 30% knew that being overweight interfered with the action of insulin. This may indicate that education regarding the items in Questions 7 and 8 are not adequately covered. Although the contents of the questionnaire was validated by a panel of experts, the poor response on Question 7 may indicate that it was an inappropriate question to include in the questionnaire.

The women scored poorly on the distractor questions (Questions 10, 11, 16, and 17). Less than 10% knew that smoking and elevated blood pressure did not increase the risk of developing diabetes. However, more than 60%, when answering those questions, chose the "I don't know" option. This indicates that most of the women who were scored as incorrect on this question were, at least, aware that they did not know the answer and only a minority believed that smoking and elevated blood pressure increased the risk of developing diabetes.

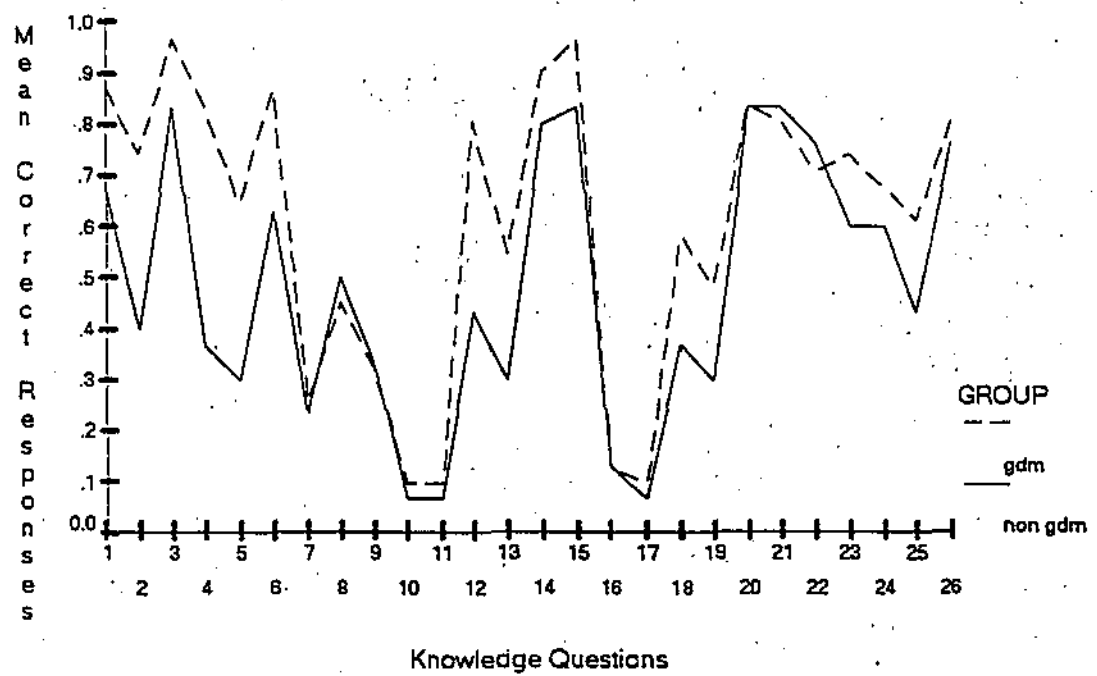


Figure 2 Performance of the GDM group and the Non GDM group on the Knowledge Questionnaire.

Questions 18 and 19 asked about the signs, symptoms, and complications of diabetes.

Approximately 60% of the women knew the signs and symptoms of diabetes and approximately 50% were aware of the complications associated with uncontrolled diabetes.

The result from Question 20 indicated that more than 80% of women were aware of community resource for diabetes.

Questions 21 to 26 elicited the women's knowledge about specific behaviours that are associated with living a healthy lifestyle and lowering the risk for developing NIDDM.

The results demonstrated that more than 70% of the women knew about types of exercises and the regimes that are recommended in the literature as part of a healthy lifestyle. More than 70% of the women knew strategies to lower stress and to maintain a healthy weight.

Questions 24 and 25 asked about foods containing fibre and methods of decreasing fat in the diet. More than 60% of the women were able to choose foods containing fibre from the list provided and approximately 60% knew of methods to reduce their fat intake.

The third purpose of the study was to answer four questions which related to the demographic information gathered from the GDM group.

Question 1. Was the knowledge of women with GDM related to age, parity, time since diagnosis of GDM, race, or facility through which diabetes was managed?

Age, parity and time since diagnosis of GDM were correlated with knowledge scores and the results are displayed in Table 8.

Table 8

Correlation of Age, Parity and Time Since Diagnosis of GDM

	Age	Parity	Time since diagnosis
Knowledge score	-.4548*	-.4605**	-.1802

* $p < .05$ ** $p < .01$

The analysis demonstrated that age and parity were significantly negatively correlated with knowledge. That is, younger women with fewer children gained higher knowledge scores than women who were older and had more children. This indicates that younger women with fewer children knew more about the implications of GDM, about NIDDM, and factors that influence the risk of developing NIDDM.

Time since diagnosis of GDM ranged from one week to 22 weeks. Interestingly, there was no significant correlation between knowledge score and time since diagnosis of GDM.

Race has been discussed as a risk factor in the development of diabetes. The study sought to discover whether the women's knowledge scores were related to race. A two tailed t-test was performed to establish if there was a significant difference in knowledge scores between participants of European descent ($N = 14$) and participants of non European descent ($N = 17$). There was no significant difference in the knowledge scores of European ($M = 17.43$) and non European ($M = 14.59$) women, $t(29) = 1.81$, $p > .05$

All of the women in this study who had been diagnosed with GDM received GDM education however, there were various facilities through which their diabetes was assessed and managed. A t-test was used to compare knowledge scores between participants ($N = 20$) who indicated that their diabetes was managed through the diabetes clinic of the participating hospital and participants ($N = 11$) who indicated that their diabetes was managed through facilities other than the diabetes clinic at the participating hospital. There was no significant difference in the knowledge scores between the women who cited the diabetes clinic as the facility through which their diabetes was managed ($M = 16.05$) and the knowledge scores of women who did not cite the diabetes clinic as the facility through which their diabetes was managed ($M = 15.54$), $t(12.87) = .24$, $p > .05$. Therefore it is concluded that women with GDM whose diabetes is not managed solely through the diabetes clinic at the participating hospital have knowledge of about GDM, NIDDM, and lifestyle associated with preventing or delaying the onset of NIDDM.

Question 2. Do women with GDM have an accurate perception of their weight?

The BMI for each woman in the GDM group was calculated to discover if the women's perception of their weight was accurate. A BMI of 20 - 25 indicates a healthy weight range (Phillips, 1986). According to the Aim for the Healthy Weight Range leaflet (n.d.), a BMI of 25 -30 indicates the individual is overweight, a BMI over 30 indicates obesity, and a BMI below 20 indicates that the individual is under weight. The BMI of each woman in the GDM group was related to her perception of weight. Table 9 displays the number of women who perceived their weight as healthy, slightly overweight, overweight, and those women who did not know into which category their weight fell. Table 9 also shows the minimum, maximum, mean, and standard deviation of the BMIs of women according to their perception of their weight.

Table 9**Perception of Weight Related to BMI of Women in the GDM group**

Perception of weight	<u>Body Mass Index</u>				
	N	Min	Max	Mean	SD
healthy weight	11	18.97	25.57	22.31	2.5
slightly overweight	5	22.19	39.9	27.37	7.25
overweight	13	26.67	47.74	32.81	5.81
don't know	2	21.76	38.06	29.91	7.02
Total	31	18.97	47.74	28.01	7.02

Eleven women perceived their weight as being healthy but only six of these women had BMIs within the healthy range. Of the remaining five women who perceived themselves as being in the healthy weight range, two had BMIs more than 25 and three had BMIs below 20. Five women perceived their weight as being slightly overweight. Two of these women had BMIs within the healthy range, two had BMIs of 26, and the remaining woman had a BMI of 29.9, which borders on obesity. Thirteen women perceived themselves as being overweight. The BMIs of all these women were more than 25, ranging from 26.67 to 47.74. Two women did not know whether their weights were healthy, under or overweight. One of these women had a BMI of 21.76 and was, therefore, within the healthy weight range. The other woman, however, had a BMI of 38.05. Nineteen women (61%) in this sample had BMIs that were above the healthy weight range. Seven women (22.6%) had an incorrect perception of their weight.

Question 3. Do women with GDM report that they have knowledge of diabetes prior to their current pregnancy?

Question 4. If so, what are the sources of their pre-existing knowledge and is there a difference in their GDM knowledge scores related to source of pre-existing diabetes knowledge?

Questions 8 and 9 in the demographic section of the questionnaire asked the participants about their knowledge of diabetes prior to their current pregnancy. This question was included as it was possible that previous knowledge about diabetes may have influenced the participants' ability to answer the GDM knowledge questionnaire. It was also felt that the educator may make judgements about the individual's level of knowledge that may affect teaching. For example, if a woman had GDM in a previous pregnancy and had received GDM education, it may be assumed that she has more diabetes knowledge than a woman who had not been previously diagnosed with GDM. Analysis of this question was undertaken to identify if this assumption was justified. Pre-existing knowledge of diabetes was gained from a variety of sources. The women identified a relative or close friend with diabetes, previous history of GDM, reading, television (TV), and their family doctor as sources from which and from whom they gained knowledge of diabetes prior to their current pregnancy. T-tests were performed to establish if there was a significant difference in knowledge scores between:

1. participants who had gained diabetes knowledge from a relative or a close friend with diabetes prior to their current pregnancy and those women who did not cite a relative or close friend with diabetes as a source of previous diabetes knowledge.
2. participants who had GDM in a previous pregnancy and participants who did not have GDM in a previous pregnancy.
3. participants who indicated that they acquired knowledge of diabetes from reading

- books, newspapers, and magazines prior to their current pregnancy and participants who did not indicate reading as a source of previous diabetes knowledge,
4. participants who indicated that the TV was a source of their diabetes knowledge prior to their current pregnancy, and participants who did not cite the TV as a source of previous diabetes knowledge,
 5. participants who indicated that their family doctor was the source of their previous diabetes knowledge and participants who did not cite their family doctor as the source of their pre existing diabetes knowledge.

There was no significant difference in the knowledge scores between women ($N = 15$) who indicated that a relative or close friend with diabetes was a source of previous diabetes knowledge and women who did not indicate a relative or close friend with diabetes ($N = 16$) as a source of diabetes knowledge. The mean knowledge score for women who acquired diabetes knowledge from a relative or close friend with diabetes was 15.93 and the mean knowledge score of women who did not obtain pre-existing knowledge of diabetes from a close friend or relative with diabetes was 16.00, $t(29) = .07, p > .05$.

Only two women in the GDM sample had a previous history of GDM. Consequently, a statistical analysis comparing the scores of women with a previous history of GDM and the scores of women who did not have a previous history of GDM could not be performed. The mean knowledge score for women with a previous history of GDM ($N = 2$) was 9.00 and the mean knowledge score of women who did not have a previous history of GDM ($N=29$) was 16.34.

Ten women indicated that they had gained previous diabetes knowledge by reading books,

newspapers, and magazines and their mean knowledge score was 18.10. The mean knowledge score of women who did not indicate reading as a source of previous diabetes knowledge ($N = 21$) was 14.81. The difference between the scores of these two groups of women fell just short of significance, $t(29) = 1.99$, $p > .05$.

Once again, as only two women indicated that they had gained previous diabetes knowledge from the TV, statistical analysis could not compare their knowledge scores ($M = 18.5$) with those women ($N = 29$) who had not indicated the TV as a diabetes knowledge source ($M = 15.69$). Likewise, only two women indicated that they had received previous diabetes education from their family doctors. The mean knowledge score for these women was 13.50 and the mean knowledge score for women who had not received diabetes education from their family doctors ($N = 29$) was 16.03.

To summarize the above findings, there was no significant difference in knowledge scores related to sources of pre-existing knowledge. Although only two women indicated that they had GDM previously, it is interesting to note that their mean knowledge score was much lower than the mean knowledge score of women who had not previously had GDM.

In this chapter, demographic data from the GDM and non GDM group was presented. The performance of the GDM and non GDM groups on individual questions was displayed and discussed. A paired t-test was performed on the total scores from the two groups providing evidence of the questionnaire's validity. The results of the questionnaire from the GDM group was also discussed and their knowledge scores were analysed in relation to demographic variables. Age and parity were found to be significantly negatively correlated with knowledge. Younger women with fewer children gained higher knowledge scores than older women with more children. To assess the women's weight, their BMIs were

calculated. Seven women (22.6%) did not indicate a realistic perception of their weight.

There was no significant difference in knowledge scores between women of European and non European descent, between the various sources of pre-existing diabetes knowledge, or between the facilities, indicated by the women, through which their diabetes was managed.

CHAPTER 6

DISCUSSION, LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

INTRODUCTION

The need for the GDM knowledge questionnaire was generated by the situation at the diabetes clinic of the participating hospital and informed by Orem's general theory of nursing (1985). In her theory of nursing systems Orem explains that the first step of the nursing process is an investigative one requiring effective methods of gaining information about individuals' self care agency. Although Orem has identified many variables that effect an individual's ability to self care, Igoe & Giordano (1992) suggest that knowledge is necessary to influence changes in attitude and behaviour. A questionnaire is a method of assessing knowledge and affords educators the opportunity to provide the learner with feedback and to give recognition of the individual's knowledge. If knowledge deficits are identified appropriate nursing can be implemented. Dunn et al (1984) identified that there is a need for short, efficient, valid, and reliable tests of diabetes knowledge. According to Spirito et al (1990), pregnant women with diabetes had been largely overlooked in the development of tests to measure diabetes knowledge.

QUESTIONNAIRE DEVELOPMENT

The primary purpose of this study was to develop a valid and reliable questionnaire to assess diabetes knowledge of GDM, NIDDM and lifestyle factors that increase or decrease the risk of developing diabetes in women who had been diagnosed with GDM. The focus of this study differed from that of Spirito et al as it was concerned with the women's potential for NIDDM in later life rather than the knowledge required to maintain normal blood sugars in pregnancy. This study described the process of developing a valid and reliable knowledge questionnaire.

Identifying its purpose was the first step of developing the questionnaire. The purpose of the questionnaire is to assess knowledge in women who have been diagnosed with GDM regarding:

- a) what diabetes is,
- b) their risk of developing diabetes mellitus,
- c) lifestyle factors that increase or decrease the risk of developing diabetes mellitus,
- d) the signs and symptoms of diabetes mellitus,
- e) the implications of having diabetes mellitus,
- f) resources in the community, and
- g) strategies that assist in living a lifestyle associated with reducing the risk of developing diabetes mellitus.

After clarifying the purpose of the questionnaire, the second and third steps were to develop items for inclusion in the questionnaire and the format of the questionnaire.

Orem (1985) asserts that self care requisites must be known if individuals are to self care and thus maintain health and well-being. The items for the questionnaire were based on the self care requisite of women with GDM. Women diagnosed with GDM have universal, developmental, and health deviation requisites. According to Orem, health deviation requisites include being aware of one's health state and the need for specific care. In that case, women diagnosed with GDM need to be aware of their potential for NIDDM, health complications associated with uncontrolled NIDDM, and strategies to prevent or delay the onset of NIDDM and complications associated with diabetes. The literature identified self care requisites associated with preventing or delaying the onset of NIDDM. Those factors are maintenance of a healthy weight, undertaking regular exercise, eating a healthy diet, and managing stress.

As suggested in the literature, a closed multiple choice question format was chosen when designing the questionnaire. To ensure its practicality, an effort was made to keep the questionnaire brief. It took participants approximately 30 minutes to complete the questionnaire which, according to Deschamp & Tognolini (1983) and Hatt & Goode (1952), was appropriate for a self administered questionnaire of this type. Effort was made to keep medical terminology to a minimum. Inclusion of words such as "hormone" and "insulin " were thought to be appropriate for women with GDM.

The "I don't know" answer option was included to try and prevent guessing. "Guessing interferes with obtaining a 'true' measure" of the respondent knowledge (Burns & Grove, 1987 p.314). More than 60% of respondents selected the "I don't know" option on Questions 10, 11, 16 and 17. It can be concluded that respondents were willing to choose this option and that it helped to prevent guessing. This also indicates that those participants who correctly answered questions, did so because they knew the answer and were not guessing. It is, therefore, concluded that the results obtained from the GDM group are a true measure of their knowledge of diabetes.

The fourth step was to establish the questionnaires validity. Content validity was established by submitting the questionnaire to a panel of health professionals involved with the care of women with diabetes. To provide evidence of the questionnaire's construct validity, a contrasted groups approach was used. The performance scores of two groups of women, which were expected to have differing responses to the items on the questionnaire, were analysed using a paired t-test.

The final step in developing the questionnaire was to calculate the questionnaire's

reliability using the Kuder-Richardson formula 20.

ASPECTS OF THE QUESTIONNAIRE REQUIRING FURTHER REFINEMENT

The majority of questions were easy to score as they were either marked correct or incorrect. However, some questions were not answered as expected making the questions more difficult to score and the results from these questions more difficult to interpret. For example, Questions 9 and 11, in the demographic section, asked about the source of diabetes knowledge prior to the current pregnancy and facility through which the current pregnancy was managed. Many participants indicated more than one answer. Thirteen combinations of answers were revealed for Question 9, and 12 different responses for Question 11 (see scoring guide Appendix E). The purpose of Question 11 was to identify if women who had been diagnosed with GDM and who had little or no exposure to the diabetes clinic had less knowledge of diabetes than women who received the majority of their education from the diabetes clinic. Because of the range of answers obtained on this question, it was not possible to draw definite conclusions. The questionnaire requires refinement on this item to identify if any women diagnosed with GDM are being disadvantaged in the care they are receiving. The inclusion of another question which asked the frequency of visits to the various clinics may have clarified participants' source of GDM education.

The question on race also provided unexpected response as some participants indicated that their race was Australian rather than choosing European, Aboriginal or Asian. The purpose of this question was to identify if there was a knowledge deficit that was related to race. Zimmet (cited in Non Insulin Dependent Diabetes Mellitus in the 90s, 1992) believes that certain races, for example Australian Aborigines, and migrants, especially those who leave a rural setting and move to urban areas or overseas, are more susceptible to developing

NIDDM. It is important to identify women who are at risk because of their race and to identify knowledge deficits in these women so that appropriate education can be given. Because of the small number of women in each race category, no conclusion regarding knowledge and race could be made in this study and further research in this area is recommended. To correctly identify an individual's race by using a questionnaire remains a problem. Observation of the individual and further verbal questioning regarding the race of the individual's parents or ancestors may provide an accurate answer to the question of race.

KNOWLEDGE OF THE GDM GROUP

As part of the study, 31 women with a history of GDM completed the GDM knowledge questionnaire and their performance on the questionnaire was analyzed and presented in chapter 5. The purpose of the questionnaire was to assess the knowledge of women with GDM. The majority of women with GDM knew what diabetes is, and knew the implications for the future of having been diagnosed with GDM. This is an important finding because, in Orem's (1985) view, individuals who are not aware of their health state and the implications of their health state are unable to effectively self care. The majority of women also knew that being overweight and a high sugar, high fat diet increased their risk of developing diabetes mellitus while regular exercise decreased their risk of developing diabetes. Stress as a risk factor for diabetes was less well known. The majority of women also knew at least two signs and symptoms of diabetes, two diabetes resource centres in the community and strategies that assist in living a lifestyle associated with reducing the risk of developing diabetes mellitus. The mean score of these women was 15.9 from a possible score of 26. Questions about the pathophysiological response particularly of being overweight and of stress were not well answered by the majority of women with GDM. This, along with the low scores attained on the distractor questions, lowered the women's

mean knowledge score.

ITEMS THAT FAILED TO DISTINGUISH BETWEEN THE GROUPS

Figure 2 demonstrates that Questions 7, 9, 10, 11, 16, 17, and 20 were answered similarly by the GDM and the non GDM group. Less than 30% of women in either group answered Question 7 correctly and less than 35% answered Question 9 correctly. Questions 7 and 9 asked about the pathophysiological effects of being overweight and of stress. The similarity in scores on these items suggest that the topics are either not covered or not sufficiently explained in diabetes education and therefore both groups of women had the same likelihood of answering the questions correctly and accounts for the similar scores attained by both groups. Questions 10, 11, 16, and 17 were distractor questions and are not related to increasing or decreasing the risk of developing diabetes. Once again the women in both groups had the same chance of answering these questions correctly. Question 20 asked about resources for diabetes information in the community. This question was very well answered by both groups with approximately 80% answering correctly. The choices given for answers to this question were a) Diabetes Association of Western Australia, b) your family doctor, c) your local hospital. The participants needed to identify 2 correct answers for one mark. The answers to this question may have been very obvious, however the purpose of the question was to ascertain that women with a history of GDM were aware of resources in the community and the results from this question demonstrates that they were. Questions 8, 21, and 22 were answered marginally better by the non GDM than the GDM group. Question 8 was about the effect that stress may have in increasing the risk of diabetes when a woman has a history of GDM. Approximately 50% of the non GDM group answered this question correctly whereas approximately 45% of the GDM group answered Question 8 correctly. The effects on the risk of developing diabetes of being overweight, of exercising regularly and of eating a diet high in fat and sugar was well

known by the GDM group. The result from Question 8 suggests that topic of stress is either not covered in the diabetes education program or is not understood by women with GDM. Women of both groups therefore had a similar chance of answering Question 8 correctly. Questions 21 and 22 asked about the recommended frequency of exercise and about recommended types of exercise. These items have been the focus of media attention and this may account for the good performance of the non GDM group on this question. The important finding from this question is that women with a history of GDM are aware of types of exercise and regimes recommended to lower the risk of developing diabetes.

DEMOGRAPHIC DATA AND KNOWLEDGE SCORES OF GDM GROUP

The third purpose of the study was to relate the knowledge scores with the demographic information of the GDM group.

As with other studies on diabetes knowledge (Doody & Grose, 1981; Karlander et al, 1980; Miller et al, 1978) age was found to be negatively correlated with knowledge. This finding is important because the literature has identified that the risk of developing NIDDM increases with age. This may indicate that older women with GDM require additional educational support or that the current programme is not effective in meeting their educational needs.

Weight has been identified as risk factor for the development of diabetes. After calculating the BMI of each woman in the GDM group, it was discovered that 19 women (61%) were overweight, seven (22.6%) did not have an accurate perception of their weight and a further two women had no perception of their weight. If women are to maintain a healthy weight that reduces their risk of developing diabetes they must be encouraged to have an accurate perception of their weight.

There was no significant difference in knowledge scores related to previous diabetes knowledge or the time since diagnosis of GDM. It is presumed that the two women who indicated that they had been diagnosed with GDM in a previous pregnancy had also received previous GDM education. Their mean knowledge score was substantially lower than the mean knowledge score of women who did not indicate that they had had GDM in a previous pregnancy. However, they indicated that they either knew "a lot" about diabetes or "quite a lot about diabetes". From 26 questions, they correctly answered 7 (26.9%) and 11 (42.3%) questions respectively. Deacon (1968) suggests that knowledge assessment needs to be carried out before and after education programmes as individuals that assume they have the "right" answers may "tune out" when involved in further education.

Although no conclusions can be drawn from the results from just two women with previous GDM, they do stimulate questions about the knowledge of women who have had GDM in a previous pregnancy and have been diagnosed with GDM again. Is there a difference in their knowledge and the knowledge of women who have been diagnosed with GDM for the first time? Are women with a history of previous GDM older and do they have more children than those women who have been diagnosed with GDM for the first time? Age and increased parity have already been discussed as being negatively correlated with knowledge. Until we know the answers to these questions, women with a previous history require at least the same level of diabetes education as other women, even though they may indicate they know "a lot" about diabetes.

As discussed in the methodology section of this thesis, new teaching strategies, for example the use of videos, have been incorporated into the education of women with GDM. As well, the women's care and diabetes management is being shared by clinics and doctors other than the diabetes clinic at the participating hospital. Did these new strategies

adversely affect the women's diabetes knowledge? The results from the GDM group of women demonstrate that there was no significant difference in knowledge scores related to the facility through which the woman's diabetes was managed. This indicates that although teaching strategies have changed in the last few years and management of GDM is shared by other clinics and doctors, most women, who have been diagnosed with GDM and have attended the participating hospital, have knowledge of the implications of GDM and have knowledge about NIDDM.

LIMITATIONS

The sampling design used in this study was convenience sampling and, therefore, not every element in the population had an opportunity for sample selection. Convenience sampling may allow biases in the sample. Therefore, convenience sampling may limit the generalizability of this study.

This study is also limited by the inconsistency of questionnaire administration.

RECOMMENDATIONS

The study has given rise to the following recommendations.

1. The process of providing evidence of the questionnaire's validity be continued.
2. Some of the demographic items (eg, race and source of GDM education) of the questionnaire require further refinement
3. The educational status of participants be included in the demographic section of the questionnaire.
4. A study is recommended to determine if there is a difference in diabetes knowledge related to race.

5. Further research is required to determine if and in what areas there is a significant difference in diabetes knowledge in women with a previous history of GDM and women who do not have a previous history of GDM.
6. Further research is recommended to determine the educational needs of older women and women with more children.
7. It is recommended that the GDM knowledge questionnaire be used in clinical practice to assist patient assessment as part of the nursing process.
8. The GDM knowledge questionnaire should be used before and after GDM education.
9. The GDM knowledge questionnaire may be used as a quality assurance tool to assess diabetes education programmes for women diagnosed with GDM.
10. It is recommended that women with GDM are provided with feedback about the accuracy of their perception of their weight.

CONCLUSION

In this study, a questionnaire was developed to assess knowledge of women with GDM. Evidence of the questionnaire's validity and reliability was provided. The questionnaire focussed on assessing the women's knowledge of potential for developing diabetes in later life and the factors associated with increasing or decreasing the risk of developing diabetes.

The majority of women who had been diagnosed with GDM and who participated in the study knew about their potential for developing diabetes, lifestyle factors that increase or decrease the risk of developing NIDDM, and strategies that may prevent or delay the onset of NIDDM and diabetic complications.

Although further refinement is indicated, the GDM questionnaire does provide a method to assess knowledge. The questionnaire could be used in clinical practice to identify knowledge deficits in women with GDM and ensure that the womens' educational needs are met. The questionnaire may also be used as a quality assurance tool to measure the outcome of GDM education programmes. Finally, the GDM knowledge questionnaire may be used as a fillip for future research.

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APPENDIX A**GDM KNOWLEDGE QUESTIONNAIRE****Section A**

Please answer the following questions in the space provided or circle the letter beside the answer or answers you select.

1. How old are you ?..... years.
2. How tall are you ?.....
3. What is your race ?
 - a) European
 - b) Aboriginal
 - c) Asian
 - d) other, please specify
4. What is your usual weight when not pregnant ?

..... kg or stone.
5. Is your weight when you are not pregnant
 - a) healthy, give or take 5 kg
 - b) slightly overweight
 - c) overweight
 - d) slightly underweight
 - e) underweight
 - f) I don't know
6. How many children do you have ?
 - a) none, this is the first
 - b) one
 - c) two
 - d) three
 - e) four
 - d) more than four, please specify.....
7. How many weeks pregnant are you ?

or

If you have already had your baby, how old is your baby?

.....
8. Did you know anything about diabetes before this/your last pregnancy ?
 - a) nothing

- b) a little
- c) quite a lot
- d) a lot

9. If you did know something about diabetes before this/your last baby, where did this knowledge come from?

(There may be more than one answer, therefore circle the letters beside the appropriate answers.)

- a) from a relative or close friend with diabetes.
- b) from having gestational diabetes in a previous pregnancy.
- c) from reading books, newspapers or magazines.
- d) from the T.V.
- e) from your family doctor.
- f) other, please explain.

10. How many weeks pregnant were you when gestational diabetes was diagnosed ?
..... weeks

11. Who do / did you see about your diabetes?

(There may be more than one answer, therefore circle the letters beside the appropriate answers.)

- a) antenatal clinic, *
- b) diabetes clinic, *
- c) antenatal clinic at another hospital.
- d) a private doctor
- e) other, please explain

* _____ indicates the name of the hospital where these clinics are undertaken. To maintain anonymity the hospital's name is deleted here but was included in the copies of the questionnaire completed by the participants.

12. Have you had gestational diabetes in a previous pregnancy?

- a) yes
- b) no
- c) I don't know

SECTION B

The following questions are about diabetes and factors that increase and decrease the risk of getting diabetes.

Please circle the letter beside the answer you select.

If you do not know the correct answer, circle I don't know.

1. People with diabetes have
 - a) too much sugar in the blood.
 - b) too little sugar in the blood.
 - c) no sugar in the blood but plenty in the urine.
 - d) I don't know.

2. Insulin is a hormone which
 - a) increases sugar in the urine.
 - b) increases sugar in the blood.
 - c) allows sugar to enter the cells of the body.
 - d) I don't know.

3. Diabetes is a disease
 - a) for which there is no treatment.
 - b) that can be cured.
 - c) that cannot be cured but can be controlled.
 - d) I don't know.

4. If you have had gestational diabetes
 - a) you will always develop diabetes in later life.
 - b) you have an increased likelihood of developing diabetes in later life.
 - c) there is little likelihood of developing diabetes in later life.
 - d) I don't know.

5. If you have had gestational diabetes in one pregnancy, will it occur again in future pregnancies?
 - a) it is unknown whether gestational diabetes will occur in future pregnancies.
 - b) it is unlikely to occur again in future pregnancies.
 - c) it is likely to occur again in future pregnancies.
 - d) I don't know.

6. Being overweight
 - a) increases the risk of getting diabetes.

- b) decreases the risk of getting diabetes.
 - c) does not effect the risk of getting diabetes
 - e) I don't know.
7. Being overweight
- a) interferes with the action of insulin.
 - b) decreases insulin production.
 - c) decreases blood sugar levels.
 - d) I don't know.
8. If you have a history of gestational diabetes, stress
- a) may increase your risk of getting diabetes.
 - b) may decrease your risk of getting diabetes.
 - c) has no effect on the risk of getting of getting diabetes.
 - d) I don't know.
9. Stress
- a) increases blood sugar levels.
 - b) decreases blood sugar levels.
 - c) decreases insulin production.
 - d) has no effect on the body.
 - e) I don't know.
10. Smoking
- a) increases the risk of getting diabetes.
 - b) decreases the risk of getting diabetes.
 - c) has no effect on the risk of getting diabetes.
 - d) I don't know.

11. Smoking
 - a) increases blood sugar levels.
 - b) decreases insulin production.
 - c) increases insulin production.
 - d) has no effect on the risk of getting diabetes.
 - e) I don't know.
12. Regular exercise
 - a) increases the risk of getting diabetes
 - b) decreases the risk of getting diabetes.
 - c) has no effect on the risk of getting diabetes.
 - e) I don't know.
13. Exercise
 - a) has no effect on the body.
 - b) increases blood sugar levels.
 - c) assists the action of insulin.
 - d) decreases the production of insulin.
 - e) I don't know.
14. A diet high in fat and sugar
 - a) may increase the risk of getting diabetes.
 - b) may decrease the risk of getting diabetes.
 - c) has no effect on the risk of getting diabetes.
 - d) I don't know.
15. A diet high in fat and sugar
 - a) may cause weight gain
 - b) decreases blood sugar levels.
 - c) has no effect on the body.
 - d) may cause weight loss.
 - e) I don't know.
16. Having high blood pressure
 - a) increases the risk of getting diabetes.
 - b) decreases the risk of getting diabetes.
 - c) has no effect on the risk of getting diabetes.
 - d) I don't know.
17. High blood pressure
 - a) decreases insulin production.
 - b) increases insulin production.
 - c) has no effect on the risk of getting diabetes.
 - d) increases blood sugar levels.
 - e) I don't know.

18. Which of the following are signs and symptoms of diabetes?
(There may be more than one answer, therefore circle the letters beside the correct answers.)
- a) weight gain
 - b) excessive thirst
 - c) passing excessive amounts of urine
 - d) high blood pressure
 - e) tiredness
 - f) frequent vaginal infections
 - g) anaemia
 - h) high cholesterol
 - i) I don't know
19. Diabetes may cause health problems such as
(There may be more than one correct answer, therefore circle the letters beside the correct answers.)
- a) stroke
 - b) anaemia
 - c) blindness
 - d) heart attack
 - e) kidney disease
 - f) cancer
 - g) I don't know
20. If you want information about diabetes who can you contact?
(There may be more than one correct answer, therefore circle the letters beside the correct answers.)
- a) Diabetes association of Western Australia.
 - b) your family doctor.
 - c) your local hospital.
 - d) I don't know

The following questions are about living a healthy life style. Please circle the letter beside your choice of answer. If a question has more than one answer, please circle the appropriate letters.

21. As part of a healthy lifestyle, it is recommended that you exercise
- a) occasionally.
 - b) 3 or 4 times a week for 30 to 60 minutes.
 - c) vigorously at the gymnasium once a fortnight for 10 to 20 minutes only.
 - d) I don't know.
22. Which of the following types of exercise are recommended as part of a healthy lifestyle ?

- a) walking briskly.
- b) cycling.
- c) swimming regularly.
- d) bungee jumping.
- e) I don't know.

23. Which of the following are recommended ways that may help to lower stress?
- a) eating a healthy diet.
 - b) exercising regularly.
 - c) getting adequate rest.
 - d) sharing problems with a partner, friend or support group.
 - e) talking to your local doctor.
 - f) talking to a psychologist.
 - g) meditating.
 - h) I don't know.
24. A healthy diet includes foods which contain dietary fibre. Which of the following foods contain fibre?
- a) meat, fish and chicken.
 - b) dairy products.
 - c) bread and cereal.
 - d) fruit vegetables.
 - e) I don't know.
25. You can reduce the amount of fat in your diet by
- a) using only polyunsaturated fats.
 - b) using low fat dairy products.
 - c) choosing low cholesterol foods.
 - d) removing fat from meat and chicken.
 - e) I don't know.
26. To achieve and maintain a healthy weight
- a) eat a diet high in fat and sugar.
 - b) exercise regularly.
 - c) eat a diet low in fat and sugar.
 - d) do not overeat.
 - e) if you drink alcohol, drink in moderation only.
 - f) eat a diet low in cholesterol.
 - g) do not use overeating as a method of lowering stress.
 - h) I don't know.

APPENDIX B INFORMATION SHEET/CONSENT FORM

KNOWLEDGE ABOUT DIABETES

Some women develop diabetes in pregnancy. This is known as gestational diabetes and usually disappears after the delivery of the baby. Women with gestational diabetes require appropriate information and education.

I am undertaking a study to develop a questionnaire about women's knowledge of diabetes and factors that may increase or decrease the risk of developing diabetes in later life. This will enable the diabetes team to provide information that is appropriate to each women.

Before the questionnaire can be used however, it must be tested and analyzed. This is where I require your help. By completing the questionnaire you will provide me with the data that is necessary for analyzing the questionnaire.

Your participation is completely voluntary. If you choose not to participate, it will not affect your care at this hospital in any way. Information collected will be strictly confidential and cannot identify you personally.

If you have any questions about the questionnaire, please contact me on 3873098.

Thank you for your help,

Caron McLarty
(Researcher)

I,....., having read the information above and having had the research explained to me by understand and consent to participate in the above study.

Signed

Date

Witness

APPENDIX C

15a Reserve St
Wembley, 6014

Dear

Thank you for agreeing to complete the enclosed questionnaire.

Please read the information page carefully and sign both copies. Your husband/partner or friend can sign as witness to your signature. Keep one copy of the information sheet.

When you have completed the questionnaire, return it to me with one of the information sheets. I have enclosed an addressed, postage paid envelope. Please return the questionnaire by April 9th.

Your sincerely

Caron McLarty.

APPENDIX D

15a Reserve St
Wembley, 6014.

Dear

I am writing to ask you to complete the enclosed questionnaire about diabetes. Please read the information sheet carefully. If you agree to complete the questionnaire, sign both copies of the information sheet. Your husband/partner or a friend can sign as witness to your signature. Keep one copy of the information sheet.

When you have completed the questionnaire, return it to me with one of the signed information sheets. I have enclosed an addressed, postage paid envelope. Please return the questionnaire April 9th. Thankyou.

Your sincerely,

Caron McLarty.

APPENDIX E**SCORING GUIDE****DEMOGRAPHIC VARIABLES**

1)	age		
2)	height		
3)	race	European	1
		Aboriginal	2
		Asian	3
		Australian	4
		unknown	5
		other	6
4)	weight		
5)	perception of weight		
	don't know		0
	healthy		1
	sl. overweight		2
	overweight		3
	sl. underweight		4
	underweight		5
6)	parity		
	0		0
	1		1
	other		2
7)	gestation		
8)	perception of knowledge		
	nothing		0
	little		1
	quite a lot		2
	a lot		3

- 9) source of knowledge prior to current pregnancy
- | | |
|---------------------------|----|
| relative / friend | 1 |
| previous GDM | 2 |
| reading | 3 |
| TV | 4 |
| family doctor | 5 |
| relative / reading | 6 |
| reading, doctor, other | 7 |
| relative, reading, doctor | 8 |
| relative, reading, TV | 9 |
| other | 10 |
| relative, reading, other | 11 |
| reading, TV | 12 |
| relative, reading, doctor | 13 |
- 10) Gestation at diagnosis of GDM
- 11) Source of diabetes education in current pregnancy
- | | |
|--------------------------------------------|----|
| ANC (participating hospital) | 1 |
| diabetes clinic | 2 |
| ANC (elsewhere) | 3 |
| private doctor | 4 |
| other | 5 |
| ANC (participating hosp.),doctor | 6 |
| diabetes clinic, antenatalclinic elsewhere | 7 |
| diabetes clinic, ANC (participating hosp) | 8 |
| diabetes clinic, ANC (participating hosp) | 9 |
| ANC (participating hosp.),ANC (elsewhere) | 10 |
| diabetes clinic, doctor | 11 |
| diabetes clinic, ANC (elsewhere), other | 12 |
- 12) Previous GDM
- | | |
|--------------|---|
| yes | 1 |
| no | 0 |
| I don't know | 0 |

SECTION B**Questions 1 - 17**

correct answer

= 1

incorrect answer

= 0

Question 18

2 correct answers

= 1

Question 19

2 correct answers

= 1

Question 20

2 correct answers

= 1

Question 21

1 correct answer

= 1

Question 22

2 correct answers

= 1

Question 23

4 correct answers

= 1

Question 24

2 correct answers

= 1

Question 25

2 correct answers

= 1

Question 26

3 correct answers

= 1