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Prevalence and Predictors of Gestational Diabetes Mellitus among Pregnant Women Attending Antenatal Clinic in Dodoma Region Tanzania

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Abstract

Background: Gestational Diabetes Mellitus (GDM) is rapidly increasing worldwide. Globally, 17.8 million pregnancies are complicated by GDM. In recent years, Tanzania has experienced a dramatic increase in the prevalence of GDM ranging from 0% in 1993 to 19.5% in 2017. GDM screening is not part of the routine antenatal services in Tanzania. This results to scarcity of data on the magnitude and risk factors for GDM among pregnant women attending antenatal clinic at Dodoma Region.

Methodology: A cross-sectional study will be carried out in Dodoma Region. A total number of 600 pregnant women will be recruited from four local health facilities. Convenient sampling will be used to select the region, district and health facilities that provide ANC in Dodoma region. Simple random sampling will be used to select study participants. Screening and diagnosis of GDM will be performed using the 2013 WHO criteria. Analysis will be done by using SPSS version 22 to determine the prevalence and predictors of GDM.

Discussion: This study aimed at accessing how big is the problem, since in our normal antenatal care services screening and treatment for GDM it is not done. Previous studies shows a dramatic increase of the prevalence of the GDM, indicating the need to screen, treat and follow up of these women for proper pregnancy and life time outcome. The study will include women regardless with their gestational age as per new WHO recommendation of GDM diagnosis Hence different results from this study is anticipated.

Keywords: Gestational diabetes mellitus; Gestational diabetes; Hyperglycemia in pregnancy; Antenatal gestational diabetes screening; Antenatal care; Tanzania gestational diabetes mellitus

Background

Gestational Diabetes Mellitus (GDM) is defined as "any degree of glucose intolerance with onset or first recognized during pregnancy" [1]. GDM is the developing problem that needs attention as it is associated with both maternal and fetal outcome [2,3].

Globally 20.9 million pregnancies are associated with hyperglycemia; among those GDM affects 17.8 million pregnancies [4]. In developed countries the prevalence of GDM ranges from 1-28%, and in Africa it affects up to 13.9% of pregnant women.

The pathophysiology of GDM is based on pregnancy as it triggers changes in maternal metabolism to accommodate the growth of the fetus. The need for continuous nourishment of the fetus is made possible by complex interactions of the feto-placental maternal unit, through pregnancy hormones such as growth hormone corticotrophin releasing hormone, placental lactogen, progesterone and prolactin. These hormones create insulin resistance to make glucose available for the fetus. However studies have reported additional factors that play great role in development of GDM include pre-pregnancy insulin resistance due to increased maternal adipose deposition, decreased exercise and increased caloric intake [5,6]. Other factors contributing to the development of GDM include family or pre-pregnancy history of diabetes, age above 25 years and high BMI, also multiparity and excessive pregnancy maternal weight gain have been associated with GDM [7,8].

Among complications associated with GDM are risk of high rate of cesarean section, preeclampsia, 3rd-4th degree perineal tear and subsequent development of Type 2 Diabetes

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Mellitus (T2DM) [9,10]. Uncontrolled diabetes mellitus (pregnancy exposed to hyperglycemia) has been associated with an increased risk of malformations, spontaneous abortion, fetal macrosomia, birth injuries, neonatal hypoglycemia, polycythemia, and hyperbilirubinemia [2,3]. Long-term outcome of children with in utero exposure to maternal hyperglycemia may include higher risks for obesity and diabetes later in life [2].

Gestational diabetes mellitus most of the time is asymptomatic and is identified incidentally during screening. There was a problem in having a consensus on screening method and strategies of GDM. Different methods are used in different countries for diagnosis depends on the countries resources and gives different results. These methods are like Fasting Plasma Glucose (FPG) and/or Oral Glucose Tolerance Test (OGTT), Glucose Challenge Test (GCT) and rapid glucose test [11]. However, fasting and/or Oral Glucose Tolerance Test (OGTT) with 75g of glucose remain the international standard method, as recommended by new WHO guide line [1]. Screening for GDM in asymptomatic women and controlling the glucose levels improves maternal and fetal outcomes [6,12,13].

GDM is a treatable condition with multiple associated predictors; some factors associated with its development are related to sedentary life style and diet [2,14]. Studies have shown that timely screening and intervention may improve the pregnancy outcome [15]. The United States Preventive Services Task Force (USPSTF) found that there is benefit in screening asymptomatic women and controlling the glucose levels as it improves the mother's and child's outcome [6,12,13].

Screening and intervention on GDM are not part of the routine package for antenatal services in Tanzania, resulted into little knowledge on prevalence of this condition in the country. Available few studies have reported the prevalence of GDM to be 8.5% in urban Dar es salaam and Morogoro and 19.5% in Kilimanjaro [16,17], with the exception of Dodoma. These studies demonstrate a possible increase of GDM prevalence in Tanzania but they included only pregnant women of certain gestational age unlike what is recommended by WHO, hence might underestimate the problem. Clear data regarding the prevalence and predictors of GDM among pregnant women at any gestational age is needed in Dodoma Region for better understanding of the extent of the problem and to devise effective interventions for prevention, screening and treatment. Hence the aim of the study is to assess the prevalence and predictors of GDM among pregnant women in Dodoma region, Tanzania.

Methods/Design

Aim

This study aim at assess the prevalence and predictors of Gestational Diabetes Mellitus (GDM) among pregnant women attending antenatal clinic at Dodoma region, Tanzania.

Study design

The study design will be the analytical cross sectional study that will involve screening for hyperglycemia in pregnancy to women at any Gestation Age (GA). Women with GDM will be identified on their ANC cards and referred for further management.

Study area

This study will take place in Dodoma region, Tanzania. Dodoma region lies at 4° to 7° latitude South and 35° - 37° longitude east. The region has approximately population of 2 million people with five districts and one urban district that are Bahi, Chamwino, Kondoa, Mpwapwa, Kongwa and Dodoma Urban. The region is the 12th largest in the country and covers an area of 41,310km^2 equivalent to 5% of the total area of Tanzania Mainland. It is a region centrally positioned in Tanzania.

Dodoma has a high burden of maternal and child health death and illnesses whereby on 2012, Dodoma has ranked the ninth high burdened region with a maternal mortality rate of 512/100,000 live births. There are efforts to improve maternal and child health through Emergency Obstetric Care (EmOC) services and building maternity waiting homes.

Both urban and rural area of Dodoma region will be studied whereby in urban the study will take place at Chamwino dispensary and Makole health center and in rural the study will take place in Bahi and Chamwino health center. The above facilities has the ability of serving 1632 women in ANC per month (Chamwino 200 and Makole 820, Bahi 460 and Chamwino 152 pregnant women in ANC) covering 80% of all women who attend for ANC in Dodoma region.

The study will take place in Dodoma region because no study with the similar nature has been done in Dodoma and we don't have the data of prevalence and predictors of GDM despite of the existing poor pregnancy outcome such as abortions, high CS rate, big babies, preeclampsia and congenital malformation which is among of the complications of GDM.

Study participants

The study involves all pregnant women at any gestation age who attended ANC at Chamwino dispensary, Makole, Bahi and Chamwino Ikulu health center.

Inclusion criteria and exclusion criteria

The study will include all pregnant women who will attend ANC in the study sites during the study period, especially those who will come in a fasting state or who agreed to come on the following day with a fasting state, which will consented to participate in the study. The study will exclude women who will fail to come in a fasting state and refuse to come on the following day in fasting state, women using drug(s), e.g. anti-malaria drug that may interfere with the glucose results such as quinine and those who will refuse to participate in a study.

Sample size

The study will involve a total 600 pregnant women attended who ANC at Makole, Chamwino dispensary, Bahi and Chamwino Ikulu during the study period. This sample was obtained by using the following formula;

$N=Z^2 P (100 - P)/E^2$

Whereby;

N=sample size

Z=standard normal distribution set at 1.96 (corresponding to confidence level of 95%)

P=prevalence of GDM (19.5) [17];

E=acceptable marginal error (5%)

Therefore;

$N =Z^2 P (100-P)/E^2$

N=241.21= 300, to obtain a represent able sample of pregnant women in any gestation age the sample will be doubled to obtain a total sample size of 600.

Proportional sampling according to the health facilities was done using the below formula;

Specific health facility= Total women at ANC per month × 600(Sample size)/ Total number of women at ANC in both facilities (1632)

Hence for Chamwino dispensary 74, Makole 301, Bahi 168, and Chamwino health 57 centers of pregnant women were purposively selected during the study period to meet the sample size of 600.

Sampling techniques

To get the sample of the participants in this study purposive sampling were used to select the region, districts and health facilities where the study was conducted. The aim was to get the representative sample of both rural and urban areas. On seven district of Dodoma Bahi, Chamwino and Dodoma Urban were selected. Form these districts four health facilities were selected these are; Bahi Health Centre and Chamwino Health Centre (rural area); Makole Health Centre and Chamwino Dispensary (urban area).

To get study participant, simple random sampling is used to select women on fasting state or who agreed to come the following day on fasting state by using list of client who attended ANC, then women are told the objective of the study and if they agree they are included in the study until the sample size on each health facilities will be obtained.

Data collection methods and tools

The study will include observation and questionnaire administration as data collection methods. The tools involved will be semi structured questionnaire and observation checklist. The questionnaire has 9 sections; demographic section, socio economic status, previous pregnancy history, current pregnancy history, family history, awareness of GDM, life style, food frequency and physical activity/exercises section. Checklist will be used in anthropometric data measurement and investigations.

Definition of Variables

Independent variables: Demographic data, previous obstetric history, current obstetric history, life style (smoking and alcoholism) and diet, BMI, MUAC, protein in urine and Hb.

Dependent variable: GDM according to WHO criteria [1].

Measurement of Variables

Independent variable

Group counseling and introduction to the study will be done, questionnaire will be used to collect some independent variables include demographic data that had 6 questions, data on socio economic status that had 11 questions, previous and present obstetric data that both had 6 question, life style and family history of diabetes had 10 questions; awareness of women about GDM had 8 questions, food frequency questions adopted from Food Frequency Questionnaire (FFQ) in a study done in Arusha and Global physical activity questions (adopted from Global Physical Activity Questionnaire (GPAQ)).

Awareness questions has been adopted from study done in Samoa [18] and modified to meet the study objective, where a woman will be considered has awareness about GDM if she at least answers three questions and two risk factors for GDM, otherwise unaware.

The FFQ was adopted from study done by Katalambula et al on the study of dietary patterns as a predictor of colorectal cancer in Arusha Tanzania [19]. Data from FFQ will be merged to twelve food items that are: cereals; tubers and roots; vegetables; fruits; meat; eggs; fish and other sea food; legumes, nuts and seeds; milk and milk products, oil and fats; sweets and spices, condiments and beverages. Then food items will be entered to SPSS for analysis that involves component factor analysis, to get the strongest patterns that describe the study participant, to either healthy or non-healthy diet; in relation to GDM.

GPAQ tools has its manual for analysis if used in a study, where Metabolic Equivalent (MET) value are used to categories a participant in either high, moderate or low physical activity. On analysis if MET value ≥1500 minute per week, the woman has high physical activity, if MET ≥150 minutes the woman has moderate physical activity otherwise low physical activity [20].

Anthropometric information will be collected using the observation checklist. Middle Upper Arm Circumference (MUAC) will be obtained by using UNICEF measurement standards and will be used to categorize women as normal before pregnancy (MUAC<28 cm) and overweight (MUAC>28 cm) basing on assumption that during pregnancy there is a negligible change of MUAC in pregnancy compared in non-pregnancy state [21], and the readings will be done by two research assistant to minimize observation error. The blood pressure will be measured on the left arm once using manual machine (MEDIZINTECHNIK stethoscope made in Germany and Aneroid sphygmomanometer). Women will be instructed to clean their perineum to collect midstream urine in a sterile container for check protein in urine by using dipstick test. Women will be diagnosed as having pre-eclampsia if the blood pressure is ≥140 mmHg for systolic and diastolic BP≥90mmHg, and protein in urine is ≥+3 (3g) [1].

Hemoglobin (Hb) levels were also measured by pricking the tip of the figure to measure the Hb level using HemoCue Hb 201+ Hemoglobin photometer. Women were classified as non-anemic (≥11g/dl), mild (9.5-10.9g/dl), moderate (8-9.4g/dl), severe (6.5-7.9g/dl) and life threatening (<6.5g/dl) anemia according to standard WHO criteria [22].

Dependent variable

There after screen for GDM will be done by registered nurse; a request to return the following day will be made in case the woman did come in a fasting state. Fasting Blood Glucose (FBG) will be taken from capillary blood and an OGTT with 75g oral glucose in 300mls of water will be administered orally to pregnant women with FBG<5.1 mmol/l (The glucose to be used was made in Nairobi/ Kenya, weighed by the UDOM-college of Health science laboratory technician and packed in 75g small packets mixed with 300mls of Afya drinking water). After 2 hours, the capillary blood glucose will be measured once again. The diagnosis of GDM will be made by using the WHO criteria [1]. Positive results of GDM will be identified in their ANC card and they will be reported to the clinicians for proper management and follow-ups.

Data Analysis

Data analysis will be done by using Statistical Package for Social Sciences (SPSS) version 22. Before analysis, the collected data will

be entered into the computer and checked for cleanness by running frequencies of all variable to remove incorrect value if any and to recheck for missing data for valid analysis. Then statistical normality test will be done to check if data are normally distributed or not by using graphs (histograms). For normally distributed data mean will be used for descriptive analysis, otherwise median or mode. Demographic analysis will be done to analyze the demographic characteristic of respondents. To test relationship between categorical variable chi-square and cross tabulation will be used. The association between variables with the control of other factors will be done by using logistic regression analysis to get prevalence and predictors for GDM. A confidence interval of 95% with the margin of error 5% (0.05) will be used as statistical measure of significance (p value of <0.05 will be regarded as significant while >0.05 not significant).

Recruitment

Four research assistants who registered nurses will be recruited and trained for one day. They will be trained on the objective of the study, interviewing technique, to familiarize with the tool and the investigation procedures. This will help the research assistants on understanding of the tool and to be consistent on data collection.

Validity and Reliability

This study will involve the sample size of 600 pregnant mothers, which is enough to estimate the prevalence of GDM in Dodoma region hence represent the population of Dodoma. The pre-test of the tools (questionnaire and observation checklist) was done in Kongwa district, to ensure the tools will capture the information that the study intended to, and modified for clarity before the actual study to be done. The questionnaire was also shared to other nurses/midwives, gynecologist and nutritionist for clarity and consistency.

Ethical Consideration

Permission to conduct the study has been obtained from Ethical Clearance Committee of UDOM and permission to carry out the study has been obtained from the Regional Medical Officer (RMO), District Executive Director (DED) and Matron/Nursing in charge of Makole, Bahi, Chamwino dispensary and Chamwino health center ANC.

Also informed consent will be obtained by explaining to the woman about the purpose of the study, benefit and harm if any and how the participants was to be handled in case of harm. All procedures involved in data collection process will also be communicated to the women before data collection. All clients who will be diagnosed to have GDM will be referred for proper treatment and follow-up.

Discussion

This study aimed at accessing how big is the problem, since in our normal antenatal care services screening and treatment for GDM it is not done. The first research showed 0% prevalence of GDM [23]. About 20 years later in the study done in Dar-es-Salaam and Morogoro the prevalence found to be 8.5%; although they used older WHO diagnostic criteria [16]. In a recent study done in Northern part of Tanzania they found the prevalence to be 19.5 by using new WHO proposed diagnostic criteria although they limited women with only gestational age from 24 to 28 weeks only [15]. This study will include all women regardless with their gestational age as per new WHO recommendation of GDM diagnosis hence different results from this previous study is anticipated.

References

1. WHO. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. 2013.
2. Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Di Renzo GC, et al. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus : A pragmatic guide for diagnosis, management, and care. Int J Gynecol Obstet. 2015; 131: 173-211.
3. Peterson LJ, Peterson CM. Pregnancy in the Diabetic Woman: Guideline for a Successful Outcome. Endocrinology and Metabolism Clinic of North America. 1992; 2: 433-456.
4. IDF. The IDF Approach of gestational Diabetes Mellitus : Wings Project Summary Report. 2017.
5. Berghella V. Maternal-Fetal Evidence Based Guidelines.
6. Tan YY, Yeo GS. Impaired glucose tolerance in pregnancy-is it of consequence?. Aust N Z J Obstet Gynaecol. 1996; 36: 248-255.
7. Al-Rowaily MA, Abolfotouth MA. Predictors of gestational diabetes mellitus in a high-parity community in Saudi Arabia. East Mediterr Health J. 2010; 16: 636-641.
8. Mardi TG, Lutfi MF. Risk factors for gestational diabetes mellitus in Sudanese pregnant women. Journal Home. 2012; 1: 79-84.
9. Kim C, Newton KM, Knopp RH. Gestational Diabetes and the Incidence of Type 2 Diabetes: a systematic review. Diabetes Care. 2002; 25: 1862-1868.
10. Lindasay RS. Gestational diabetes: cause and consequence. The British Journal of Diabetes & Vascular Disease. 2009; 9: 27-31.
11. Nielsen KK, de Courten M, Kapur A. The urgent need for universally applicable simple screening procedures and diagnostic criteria for gestational diabetes mellitus--lessons from projects funded by the World Diabetes Foundation. Glob Health Action. 2012; 5.
12. Barakat MN, Youssef RM, Al-Lawati JA. Pregnancy outcomes of diabetic women: Charting Oman's progress towards the goals of the Saint Vincent Declaration. Ann Saudi Med. 2010; 30: 265-270.
13. Mover VA, U.S Preventive services Task Force. Screening for gestational diabetes mellitus: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014; 160: 414-420.
14. Liu J, Xie X, Guo Y. Effects of health education intervention at gestation period on pregnancy outcome of diabetes mellitus patients. Biomedical Research. 2017; 28.
15. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Parikka-Ilannnne P, et al. Prevention of type 2 Diabetes Mellitus by Changes in lifestyle among subject with impaired glucose tolerance. N Engl J Med. 2001; 344: 1343-1350.
16. Mwanri AW, Kinabo J, Ramaiya K, Feskens EJ. Prevalence of gestational diabetes mellitus in urban and rural Tanzania. Diabetes Res Clin Pract. 2014; 103: 71-78.
17. Njete HI, John B, Mlay P, Mahande MJ, Msuya SE. Prevalence, predictors and challenges of gestational diabetes mellitus screening among pregnant women in northern Tanzania. Trop Med Int Health. 2018; 23: 236-242.
18. Anne LP, Jade LL, Elizabeth LA, Ahmed Z. Awareness of Gestational Diabetes and its Risk Factors among Pregnant Women in Samoa. Hawai J Med Public Health. 2017; 76: 48-54.
19. Katalambula LK, Ntwenya JE, Ngoma T, Buza J, Mpolya EA, Paul E, et al. Dietary patterns as a predictor of colorectal cancer among general health population in Arusha Tanzania: A population based descriptive study. Inter J Nutrit Metabol. 2017.
20. WHO: Department of Chronic Disease and Health Promotion Surveillance and Population-Based Prevention. Global Physical Activity Questionnaire. Geneva, Switzerland.

21. Khadivzadeh T. Mid upper arm and calf circumference as indicator of nutritional status in women of reproductive age. East Mediterr Health J. 2002; 8: 612-618.

22. WHO. Haemoglobin concentrations for diagnosis of anaemia and assessment of severity. Vitamin and mineral nutrition Information System. Geneva, World Health Organization. 2011.

23. Lutale JK, Swai A, Mclarty D, Alberti K. Glucose tolerance during and after pregnancy in nondiabetic women in urban population Tanzania. Diabetic Care. 1993; 16: 575-577.