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Classification and Management of High-Risk Pregnancies and the Influence of Antenatal and Nutritional Interventions on Pregnancy and Delivery Outcomes in 1097 Pregnant Women on the MICHD program in Lagos State, Nigeria

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Abstract

This study was carried out to monitor 1097 women on the MICHD project. This was an independent monitoring and evaluation study on indigent women in Lagos State. The study was to evaluate the impact of antenatal visits and nutritional interventions on the Mother, Infants and Child and their pregnancy journey; while accessing the impact of the interventions on the High risk pregnancies and their outcome. The cohorts were divided into 2 major groups. The MICHD Plus group with 502 pregnant women (they attended weekly antenatal incentivized by weekly food Packs and Iron supplements for 12 weeks) and the MICHD control group with 595 pregnant (they attend regular antenatal for the same duration without the intervention). The antenatal visits reports were electronically automated and data of all pregnant women on the project collected and transcribed into a Gerocare MICHD application. Statistical analysis of antenatal variable and essential elements of a focused approach to Antenatal Care especially for the high-risk women were analyzed. Stability check reports of the antenatal visits monitored on the application at week 1, week 16 and week 20 showed the percentage of stable women at 56%, 71% and 93% respectively. Report shows that the MICHD cohorts' attendance records estimates that 85% of the women attended antenatal between 4 - 13 times during the research period. The High-risk pregnancies were identified and classified; there were 21 women below age 17, 13 had Hepatitis B, 36 had High Blood Pressure, 191 were Obese, 189 had Overweight BMI, 23 had Underweight BMI, and 14 women were above the age of 40. A total of 437 women were identified as High Risk and 610 women were No Risk. 78.3% of the 437 women had vaginal deliveries with no complications, while 87.7% of the no risk had vaginal deliveries. This shows that the interventions were able to improve pregnancy outcomes in 381 High risk women. Of the MICHD Plus intervention group 51% were high risk at takeoff but at delivery 84.2% of the women delivered with no complication and vaginally. An even higher percentage compared to the MICHD control that had less high risk women at takeoff. The results shows that focused approach to antenatal care and enhanced nutrition can improve pregnancy outcomes and reduce the chances of Caesarian surgery in high-risk pregnancies.

Introduction

A pregnancy is considered high-risk when there are potential complications that could affect the mother, the baby, or both. High-risk pregnancies require management by a specialist to help ensure the best outcome for the mother and baby [1]. Theodore et al [2] classified low-risk pregnancies as those in healthy women between the ages 18 and 34, who present at least once in the first trimester, who have had no more than three previous normal live births, no previous stillbirths or obstetric complications such as gestational diabetes or pre-eclampsia, and who have no history of drug or alcohol abuse, and no major medical conditions such as hypertension or kidney disease. Such women should be followed in a routine prenatal care program.

High-risk pregnancies (HRPs) are defined as those pregnancies with pre-existing or current conditions that put the mother, the

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foetus, and the new born baby at higher-than normal risk for complications during or after the pregnancy and birth [3]. These include very young and older women, those with low levels of education and nutrition, as well as those with previous or current medical and obstetric complications and those in poverty or unstable living arrangements. HRPs should be identified as early as possible so that the patient can be given special care for her benefit and especially for the well-being of the foetus and new born. Identification and management of high-risk factors initially and throughout pregnancy improve pregnancy outcomes for the mother and the new born [4].

Some predictors and risk factors of HRP include maternal age (too young or too old), primiparas or grand multiparas, previous obstetric difficulties, other medical conditions (e.g., HIV, hypertension, heart disease, diabetes, kidney disease, or mental illness such as depression), malnourishment, poverty, women who attend STI clinics, and use of cigarettes, alcohol, or other drugs [5-8].

Risk factors may include social and economic factors such as adverse family circumstances, housing, financial status, and working conditions. The medical and obstetric history provides evidence of previous risks such as frequent abortion, complications in pregnancy, or medical conditions that could affect the mother during the pregnancy or at the time of delivery. Pregnancy under the age of 16 or 17 or over the age of 35 should automatically define the pregnancy as being at higher-than-normal risk [9,10].

Maxwell and Farine [11], in Obesity and Obstetrics, described that weight and body mass index assessment and gestational weight gain pregnancy risk is directly related to maternal BMI [5]. Thus, all pregnant women should have their weight and height measured using appropriate equipment, and their BMI calculated and recorded at the antenatal booking visit, preferably by 10 weeks of gestation. In women with obesity, weight should be repeated during the third trimester, to enable appropriate planning for labour and postpartum.

Risk of complications is higher in women carrying more than one foetus (twins and higher-order multiples). More than one-half of all twins and as many as 93% of triplets are born at less than 37 weeks' gestation [6]. Grand multiparity (i.e., more than three previous births) or a first pregnancy (primigravida) should also be considered as an extra risk for the mother, but more so for the new born.

A recording and scoring system during antenatal provide a set of standards or guidelines for risk assessment to assist the primary care provider in early detection and referral of patients on the basis of a reasonably objective set of criteria for high-risk factors. Detailed guidelines are needed to implement this kind of standard for HRP and monitoring is of value to improved pregnancy care. The form and guidelines developed should take into account local risk factors, such as high consanguinity rates in some societies or chronic malnutrition in the population [10,11].

Antenatal care is essential for protecting the health of women and their unborn children. Through this form of preventive health care, women can learn from skilled health personnel about healthy behaviours during pregnancy, better understand warning signs during pregnancy and childbirth, and receive social, emotional and psychological support at this critical time in their lives. Through antenatal care, pregnant women can also access micronutrient supplementation, treatment for hypertension to prevent eclampsia, as well as immunization against tetanus [12]. Antenatal care can also provide HIV testing and medications to prevent mother-to-child transmission of HIV. In areas where malaria is endemic, health personnel can provide pregnant women with medications and insecticide-treated mosquito nets to help prevent this debilitating and sometimes deadly disease [13].

The lowest levels of antenatal care are observed in sub-Saharan Africa and South Asia. Percentage of women aged 15-49 attended by any provider at least four times during pregnancy. Today, 88% of pregnancies has a physiological course during which just basic care, while in 12% of cases there is a high-risk pregnancy that requires additional assistance and specific. The approach that should be used is that of supervision in all pregnant women considering their potential to have a normal pregnancy until there is no clear evidence to the contrary [10].

Nearly 15 percent of babies worldwide are born with low birthweight [14]. In 2015, 20.5 million newborns, an estimated 14.6 per cent of all babies born globally that year, suffered from low birthweight. These babies were more likely to die during their first month of life and those who survived face lifelong consequences including a higher risk of stunted growth, lower IQ, and adult-onset chronic conditions such as obesity and diabetes. To grow a healthy baby, mothers need good nutrition and rest, adequate antenatal care, and a clean environment [15]. Together, these ingredients for a healthy pregnancy can help to prevent, identify and treat the conditions that cause low birthweight and thus foster achievement of the World Health Assembly (WHA) nutrition target to reduce low birthweight by 30 per cent between 2012 and 2025.

Interventions that can help as risk management of pregnancies include; regular monitoring of blood sugar level and maintaining control, eating a healthy diet, maintaining a healthy weight, maintaining a daily record of diet, exercise, and glucose level. These have been identified as ways to manage high risk pregnancies and make them low risk [16].

Identifying available technologies for antenatal care and points where new and improved ones are needed, the discussion reviews the following categories of risk and actions and their associated technologies: basic care for all women; risk assessment -- potential danger; immediate danger and immediate action. Aspects of program management, including goals, intervention strategies, record keeping, and training and supervision are also considered. All pregnant women need access to basic antenatal health care. The availability of such care allows high risk groups and individuals to be detected. An important aspect of basic antenatal health care is advice on how pregnant women can stay healthy. The importance of a good diet should be emphasized, and pregnant women should also be taught ways to prevent or relieve the minor discomforts of pregnancy [17]. Women should be informed which conditions are normal during pregnancy and which are signs of danger. When pregnant women are receiving

basic antenatal care, they should be assessed for factors that can indicate potential danger or complications at the time of delivery [18].

A well-developed HRP assessment, referral and follow-up system contributes to improved outcomes for both mothers and new-borns, preventing costly long-term consequences of maternal and infant morbidity and mortality. Its role in preventing complications during and following delivery is well justified on medical, public health, and economic grounds [13].

Method and methods

Materials

Nutritional Composition of MICH PLUS PACK

The nutritional content of the MICH Plus Pack include: Protein; Carbohydrate; Lactose; Milk fat; Vitamins A, C, D3, E, B1, B2, B3, B12 and Calcium. The drug supplement comprises folic acid..

Methods

Data collection

Information was collected using the Gerocare application and the information generated by Mumsprings; data ranging from BMI, nutrition indices, blood pressure, Antenatal attendance, complications that may arise, Child birth indices and maternal health indices was collected and statistically reported under various studies.

Antenatal visits

Information concerning all beneficiaries on the project we automated into the MICHD antenatal application which has a dashboard to show summary of activities. The app was specifically designed for data collection and analysis of the collected data. Additional information was added to the generic antenatal visit forms and this additional information was collected to ensure the data collected can be used to make inferred judgments and recommendations. The platform adequately provided a data collecting system which gave an insight on how antenatal information can be collected nationwide and be used to analyze current treads and changes experienced. It will also enable us monitor hospital attendance and encourage better nutrition, care and hygiene.

To Monitor health status of 1097 Participants on the MICHD project and drive an improvement in antenatal attendance was recorded on the Gerocare Application.

The high-risk women were managed by a focused approach antenatal where they are closely monitored and treated according to their high-risk variables.

Selection criteria for cohorts

The criteria for selection of the 20 pregnant women for the MICH Cohort per LGA and LCDA are as follows: They were randomly divided into 2 groups 10 MICHD Plus (Received Food intervention) and 10 MICHD control (Attended antenatal with no food intervention but incentivized with Postnatal care.

1. Must be pregnant and underprivileged.

2. EGA must be between 21-24wks

3. Must be registered for ANC at the PHC within the LGA/LCDA

4. Must possess a LASRRA card

5. Must be resident in the LGA/LCDA

6. Must be from low-income household

Participants for the Study

- 1097 participants spread across the 57 LGAs/PHCs
- Those in their 2nd to 3rd Trimester were used in the study on nutritional assessments as part of the short-term outcomes of the cohort study.

Interventions that were used

1. Regular Antenatal visits weekly
2. Regular monitoring of blood sugar level and maintaining control.
3. Eating a healthy diet.
4. Maintaining a healthy weight.
5. Maintaining a daily record of diet, exercise, and glucose level.

These have been identified as ways to manage high risk pregnancies and make them low risk [16].

1- Identify and analyze changes in stability levels and antenatal visits

We identified and analyzed the entire population and monitored their stability levels from antenatal reports with corresponding results of monitored antenatal visits.

2- Monitored the effect of food and drug supplement on the pregnant mothers and infants at delivery.

This involves but is not limited to BMI reading, fundal size from ultrasound scan, on a weekly basis for all participants; 10 received food supplements and 10 who did not receive the food supplements. All antenatal indices were collected and changes within the cohort reported (Before, during and after) and compare with the control (Before, during and after).

3- Identify and analyze frequency and distribution of various predisposing High Risk factors

This study addressed the predominant high risk factors faced by the cohort women. These factors would be reported according to how predominance within the cohort.

4- Identify and analyze changes in risk levels due to the nutritional and antenatal intervention

This study addressed changes in risk levels validated by the mode of delivery at the end of the pregnancy.

Duration of study

Study was carried out for 3 months as a case study and after initial reports are presented a full research will be carried out and yearly analysis will be considered for the next 3 years.

Analysis of the data

Data was analyzed by using Microsoft office Excel Spreadsheets.

Results

Table 1. *Antenatal attendance indices and intervention distribution summary*

TOTAL MICHD PARTICIPANTS:	
NO. of MICHD PLUS BENEFICIARIES	**ANTE-NATAL VISITS DONE**
334	>12
32	11
40	10
36	9
38	8
30	7
21	6
25	5
36	4
29	3
37	2
36	1
	0
NO. of MICHD CONTROL BENEFICIARIES	**ANTE-NATAL VISITS DONE**
348	>4
37	3
18	2

A total of 940 Beneficiaries on the MICH project have above the required 4 Visits for an Ideal antenatal requirement. (85%)
Table showing MICHD number of focused antenatal visits carried out by beneficiaries

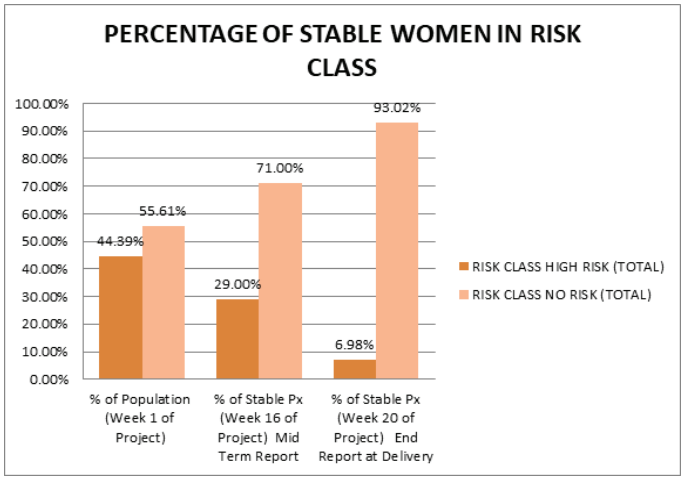

Figure 1. *Stability report from focused antenatal care*

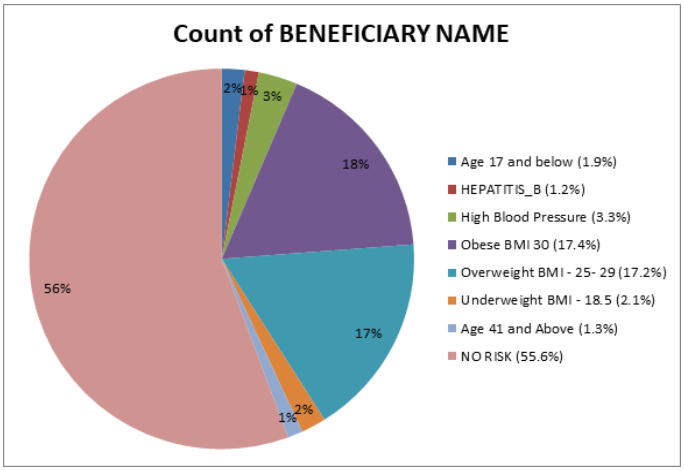

Figure 2*. Identification of High-Risk Factors*

The figure shows focused antenatal reports and stability of pregnant women at takeoff of the study until delivery. The status of the women was recorded during the onboarding process the first week of study and updated at 16 weeks and at delivery.

The figure showing percentage distribution of all high-risk categories classified from the antenatal reviews. It also shows the percentage of no risk population from the entire population.

Table 2: *Classification and Distribution of High-Risk Pregnancies*

HIGH RISK CLASSIFICATION AND DISTRIBUTION			
Row Labels	**No. of BENEFICIARY**	**% amongst Risk Population**	**% amongst total Population**
Grand Total	1097	-	100.00%
Total MICH Plus	502	-	46%
Total MICHD Control	595	-	54%
Total HIGH RISK	487	100.00%	44.39%
HR MICHD CONTROL	237	48.70%	21.60%
Age 17 and below	8	1.60%	0.73%
HEPATITIS_B	4	0.80%	0.36%
High Blood Pressure	15	3.10%	1.37%
Obese BMI 30	92	18.90%	8.39%
Overweight BMI - 25- 29	102	20.90%	9.30%
Underweight BMI - 18.5	6	1.20%	0.55%
Age 41 and Above	10	2.10%	0.91%
HR MICHD PLUS	250	51.30%	22.79%
Age 17 and below	13	2.70%	1.19%
HEPATITIS_B	9	1.80%	0.82%
High Blood Pressure	21	4.30%	1.91%
Obese BMI 30	99	20.30%	9.02%
Overweight BMI - 25- 29	87	17.90%	7.93%
Underweight BMI - 18.5	17	3.50%	1.55%
Age 41 and Above	4	0.80%	0.36%
NO RISK	610	100.00%	55.61%
NR MICHD CONTROL	358	58.70%	32.63%
NR MICHD PLUS	252	41.30%	22.97%

The table above shows the classifications of the high risk pregnancies and their distributions under high risk and low risk. Also show their distributions under MICHD Control and intervention group MICHD Plus

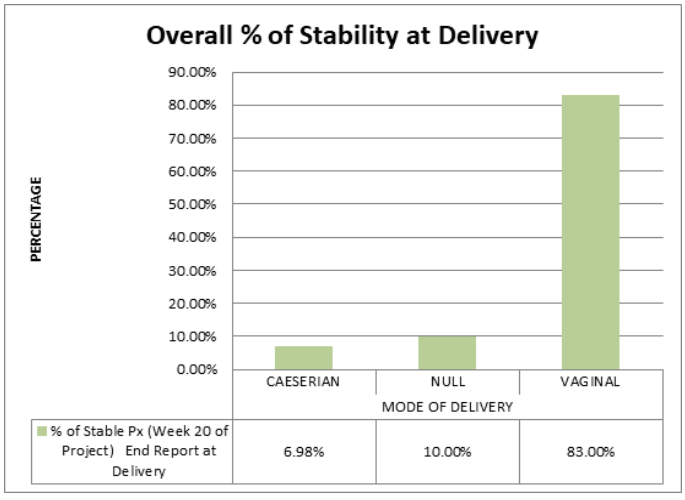

Figure 3. *Delivery Report*

Figure 3 shows the stability report of the women during the final delivery. The percentage of women scheduled for caesarian section and vaginal delivery.

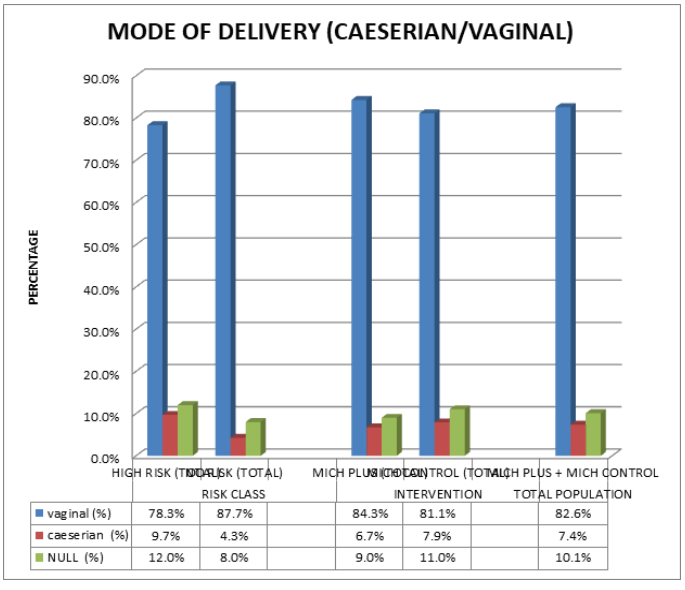

Figure 4. *Mode of Delivery*

Discussion

1097 women were used for a cohort study on how focused antenatal care and nutritional interventions can reduce the risks in high-risk pregnancies amongst the cohort. A total of 940 Beneficiaries on the MICHD project have above the required 4 Visits for an Ideal antenatal requirement. This accounted for 85% of the women. Table 1 shows number of MICHD beneficiaries and the number of antenatal visits attended.

The antenatal visit report details were automated during every visit. Hospital officials and data entry officers upload the visit variables and the medical officer in charge indicates the stability level of the pregnant mother based on the visit assessment marked as Stable or unstable. Figure 1 shows focused antenatal reports and stability of pregnant women at takeoff of the study until delivery. The status of the women was recorded during the onboarding process the first week of study and updated at 16 weeks and at delivery (20 Weeks). In Week 1, 44.39% were unstable and high risk. With the interventions and focused antenatal care there were 71% of women stable at 16 weeks. By the end of each pregnancy before delivery the stability check shows that 93.02% of the women were stable and ready for vaginal deliveries [19].

High risk pregnancies were identified and classified under various high risk variables. There were 21 women below age 17, 13 had Hepatitis B, 36 had High Blood Pressure, 191 were Obese, 189 had Overweight BMI, 23 had Underweight BMI, and 14 women were above the age of 40. Table 2 shows the percentage distribution of all high risk categories classified from the antenatal reviews. It also shows the percentage no risk population from the entire population as 55.6 % of the women while 487 women (44.4%) were high risk [1]

Table 2 shows the classifications of the high risk pregnancies and their distributions under high risk and no risk. It also shows their distributions under MICHD Control and intervention group MICHD Plus. Out of the 487 High risk women 51.3% of them (250) were from the MICHD Plus group (Intervention group) and this made up 22.6% of the total population of women. The MICHD control had a total of 237 high risks compare to 250 in the intervention group. The total no risk population was 610 women and 58.7 of them were MICHD control [20].

In Figure 3, the stability report of the women at delivery shows the delivery outcomes in percentage of women who had caesarian section and vaginal delivery. 83% were stable for vaginal delivery and 6.98% had caesarian surgery.

Figure 4 shows a bar chart of the percentage of vaginal deliveries compared to caesarian surgery in the risk class (High risk and no risk) and a comparison of the delivery mode between MICHD plus intervention group and the MICHD control. There is also on the bar chart the total population mode of delivery distribution which was 83% vaginal. Of the MICHD Plus intervention group 51% were high risk at takeoff but at delivery 84.2% of the women delivered with no complication and vaginally. An even higher percentage compared to the MICHD control that had less high-risk women at takeoff [21].

Conclusion

The overall results show that focused antenatal care and enhanced nutritional interventions can improve pregnancy outcomes and reduce the chances of Caesarian surgery in high-risk pregnancies.

Informed consent

Approval letter of consent was also gotten from the pregnant subjects to be used in the study. The individuals were intimated on the safety protocols of pregnancy related study and may wish to pull out from the study at any time without being penalized. The information gotten from the subjects was recorded chronologically and handled privately.

Ethical approval

The official ethical clearance for using human (pregnant) subjects was obtained from the Research Director of the Lagos State Health Service Commission. Permission was sought from the authorities to conduct the study in the area needed for the study. The purpose of the study was clearly explained to them.

Conflict of interest

Author declares that there is no conflict of interest.

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Research Team / Project Partners

- Office of Civic Engagement - Process owner and coordinator.
- Primary Health Care Board - Medical and research Partners, Mobilization and medical observation of pregnant participants under the M.I.C.H program; conduct of case study, research and monitoring
- Lagos State Health Service Commission - To attend to referrals (complications) from PRIMARY HEALTH CARE CENTERS.
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