SONOGRAPHIC BIOPHYSICAL PROFILES AMONG PATIENTS WITH PREGNANCY INDUCED HYPERTENSION ATTENDING MUHIMBILI NATIONAL HOSPITAL

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By

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A Dissertation Submitted In Partial Fulfillment of the Requirement for the Degree of Master of Medicine (Radiology) of the Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for examination for the dissertation entitled**,"Sonographic Biophysical Profiles among Patients with Pregnancy Induced Hypertension attending Muhimbili National Hospital",** in partial fulfillment of the requirements for the degree of Master of Medicine (Diagnostic Radiology) of Muhimbili University of Health and Allied Sciences.

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Dr. Zuhura Nkrumbih

Supervisor

_____

Date

DECLARATION AND COPYRIGHT

I, **Himidi A. Mwaitele**, declare that, this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature……..... Date…….

ACKNOWLEDGEMENT

Ultimate gratitudes are extended to God the Almighty for His amazing grace throughout the conduction and completion of this dissertation.

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Last, but not least I would like to acknowledge the support I have received from the MOHSW through the directorate of Postgraduate studies, with which I have managed to conduct this study.

DEDICATION

This work is dedicated to Martha, Abigail and Elvin; my wife, daughter and son respectively, for their unconditional love and patience.

ABSTRACT

Background: Pregnancy Induced Hypertension (PIH) is among the leading causes of maternal and neonatal morbidity and mortality. Developing countries carry a heavier burden. Therefore, more efforts are necessary to study this area in order to improve maternal and fetal wellbeing. Biophysical profiles among patients with PIH is the screening method employed.

Objective: To determine sonographic biophysical profiles among patients with PIH attending MNH.

Materials and Methods: Cross sectional hospital based study was conducted from July 2013 to March 2014 involving 152 patients with PIH, at MNH. Consented candidates with PIH from 28 weeks of gestation to term were included. Structured, closed ended questionnaires and sonography were used. The data were processed and analysed using SPSS version 20.

Results: The candidates were aged between 18 and 41 years, with the mean age of 28 years, median 28 years and mode of 25 years. Among them 63.8% were married, and 49.3% had formal employment. Uncontrolled BP was related with reduced fetal breathing movements in 8.3% candidates. Cohabiting candidates showed worse BPP (34.8%) compared with the married group (10.3%), P-value 0.01. CONCLUSION; BPP is a useful tool for surveillance of fetal wellbeing among patients with PIH. RECOMMENDATIONS; Community based study using bigger sample size is recommended to study the relationship between PIH and BPP. Random sampling is recommended so as to ascertain relationship between BPP and PIH.

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LIST OF ABBREVIATION

AFI/V	Amniotic Fluid Index/Volume
BPP	Biophysical Profile
rBPP	Rapid biophysical profile
CSF	Cerebral Spinal Fluid
HIE	Hypoxic Ischemic Encephalopathy
IVC	Inferior Vena Cava
LNMP	Last normal menstrual period
MNH	Muhimbili National Hospital
MOHSW	Ministry of Health and Social Welfare
MUHAS	Muhimbili University of Health and Allied Sciences
NST	Non Stress Test
PIH	Pregnancy induced hypertension
SPSS	Statistical Package for Social Sciences

Definition of Terms

Fetal Compromise……. Any fetal score less than 6/8 on sonographic biophysical profile was considered compromised and management was guided according to the severity of the compromise and gestation age, as outlined in the introduction[5,6,21].

AFI…… Amniotic Fluid Index, obtained by consideration of all four quadrants of the amniotic fluid.

Fetal tone……. Active bending and straightening of the fetal trunk

Fetal gross movements…… Movements of fetal parts, especially limbs

Fetal breathing movements.. Fetal Diaphragmatic movement

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

PIH is defined as de novo elevation of systolic BP> or =140, and/or diastolic BP> or =90 mmHg after 20 weeks of gestation[1], when it is accompanied with proteinuria (>0,3g/24hours), pre-ecclampsia results[2].

Intrauterine fetal compromise is mainly caused by hypoxia, which occurs as a result of deprivation of the fetus of oxygen during pregnancy or peripartum. Being one of the main Public Health concerns Worldwide due to significant perinatal and early neonatal morbidity and mortality, massive campagnes have been employed, leading to marked improvement in fetal wellbeing throughout pregnancy, however, more efforts are required in developing countries[3].

This study was geared to dwell on fetal hypoxia precipitated by pregnancy induced hypertension, aiming at picking up early features suggestive of fetal hypoxia, for prompt intervention to be instituted, for a better outcome of pregnancy in such circumstances. Sonographic biophysical profile was the employed tool[4]

1.1.1 Causes and risk factors

There are many causes of hypoxia, namely; (1) low partial pressure of oxygen in the blood, because of (i) low oxygen in inspired air, e.g. at altitude, (ii) inadequate ventilation due to lung disease or respiratory depression, accompanied by air hunger, (iii) defective transfer of oxygen from lung alveoli to blood; (2) low oxygen carrying capacity of blood due to low or defective haemoglobin, (3) Cardiac failure; (4) Cellular intoxication[5].

1.1.2 Manifestation

Compromised fetus presents with weakness, cyanosis, inability to suck, and hypothermia[6]

However, fetal compromise is said to have a greater impact among schizophrenic patients and first degree relatives compared to general population[7.]

1.1.3 Diagnosis

Obstetrical indications determine whether and when a biophysical profile is carried out, by a prenatal ultrasound, using a scoring system also known as Manning's score(Biophysical profile), which is primarily a non-invasive test for determining fetal compromise, such that measures can be taken to prevent metabolic acidosis and eventually fetal death[4, 8]

Both acute and chronic hypoxia can be assessed by the use of biophysical profile, which, is sonographically based on four variables, namely; fetal breathing movement, fetal movement, fetal muscle tone and semi-quantitaive amniotic fluid volume assessment. The non-stress fetal heart testing is not included here. The first three variables are consistent with immediate fetal health, while the last one reflect long term fetal health[4, 9]

It is worthy noting that BPP vary with circadian rhythm, possibly associated with fetomaternal hormonal changes, which would lead to false positives if not taken into consideration during data analysis[10].

The main goal of fetal assessment is to establish fetal wellbeing and whether beneficial outcome will be achieved from early intervention of risky pregnancy, such as PIH[11].

1.1.4 BPP Scoring

It has been outlined that 2 points are given for the best response in each category, while 0 is the poor score, there is no intermediate score for a weak response, the response is either present or absent. A score of 8 is normal, whereby a compromised fetus will reveal decreased body movement, fetal tone and/or breathing, and, on long standing, reduced amniotic fluid volume. The range of BPP score is tabulated below[12].

1.1.5 Management

To date many deaths of new born babies are related to birth asphyxia, which we aim at preventing by picking early features of compromised fetus among pregnant women with PIH. Left unchecked, majority of pregnancies at risk will end up with possible loss of the baby[13]

The best timing for delivery is achieved through the use of BPP in compromised fetuses so as to guide attending obstetricians during management of patients at risk. This study was conducted in America[14].

BPP score and recommended management;

BPP score	Recommended management
< or = 2	• Deliver the mother (induce labor/caesarian section)
4	• Induce labour if G.A>32weeks • Repeat test same day, if <32weeks and BPP <6 deliver the mother • Induce labor if >36 weeks, a favourable cervix and normal AFI
6	• Repeat the test if <36 weeks and unfavourable crvix • Deliver if BPP <6 • Follow up if BPP is >6
8	• Caesarian section if presence of oligohydramnios

KEY:

2= severely poor BPP

4=moderately poor BPP

6=mildly poor BPP

8=Normal BPP

1.2 LITERATURE REVIEW

Severe PIH is still a major cause of fetal compromise and mortality[15]

Studies done in North America revealed an increasing incidence and eventually prevalence of PIH, requiring prompt diagnosis and accurate treatment by emergency obstetricians to prevent associated morbidity and mortality[16,17].

There is evidence of increasing incidence of PIH in sub Saharan Africa, and that, developing countries have had constantly higher rates of mortalities associated with severe PIH, reflecting the need to study further in this area[18,19].

Several ultrasonographic modalities to assess fetal wellbeing, among these BPP, fetal biometrics and umbilical artery Doppler are useful[20].

Prenatal fetal surveillance was introduced in the USA in the 1970s, among other tests, the BPP and its modified version had become more useful than contraction stress test which would not apply to some high risk pregnancies[21,22,23].

A BPP is a recommended tool fetal surveillance in pregnant women with PIH even among candidates with no obvious complications in Thailand as it was useful in prevention of fetal compromise such as hypoxia or still birth[24].

A BPP has also been similarly emphasized in Brazil and North America showing that the chief aim of antenatal evaluation is to establish risky pregnancies so as to prevent poor outcomes.

Meanwhile, the last two decades have revealed development in fetal assessment, with BPP being the accurate and reliable tool for the purpose, compared to the NST or contraction stress test[25,26,27]

However, BPP alone is not adequate especially in IUGR management, given the false results associated. Due to the variability of findings, more studies are needed to study the current approach in relation to fetal compromise as pointed out in the study conducted in USA[28].

Regarding the amniotic fluid volume, the amniotic fluid index (AFI) offers no increased advantage over the single deepest pocket technique when used concurrently with other parameters of BPP. This was found out in the study done in America[29].

It is now known that BPP can be used intrapartum and has been found to outweigh the usefulness of FHR monitoring to predict the need for surgical intervention or the overall outcome[30].

In overcrowded hospitals or in resource-scarce centres, rBPP is an equally effective tool to predict fetal compromise in risky pregnancies, with the advantage of speed and accuracy, as found out in the study carried out in Thailand[31, 32].

However, in one study in East Africa, it was revealed that for evaluation and monitoring patients with severe PIH, BPP was not a very sensitive test for fetal wellbeing[33].

A study done in the USA concerning maternal age, it was revealed that there was no significant difference between age groups and perinatal complications[34].

In Tanzania, the prevalence of PIH and associated pre-ecclampsia ranges from 5-10%. Where it is pointed out that the clinical staff have fairly adequate knowledge about this ailment, however, the main constraint being scarcity of facilities to manage the condition[35].

1.3 PROBLEM STATEMENT

Pregnancy induced hypertension (PIH) and associated complications are among the most implicated causes of significant fetal compromise, maternal morbidity and mortality[36].

PIH is estimated to affect about 7-10% of all pregnancies in USA[37].

The situation is generally worse in the developing countries with constantly higher rates of poor outcomes following PIH[19].

In Tanzania less and less is known regarding the PIH at large and associated complications particularly towards the fetal wellbeing, despite similar prevalence rates[2].

The causes of PIH have not been well established despite the magnitude of the problem and associated complications. Therefore emphasis is maintained on the importance fetal monitoring among risky pregnancies so as to assess fetal wellbeing and establish best time of delivery in given circumstances[25].

Worse still, BPP is not routinely requested by attending obstetricians, possibly reflecting the scarce knowledge on how useful a BPP can be[38].

1.4 RATIONALE

Biophysical profiles have been reported in different parts of the developed world, with documented coverage in relation to PIH. On contrary, only few reports are available in the developing world. Despite the limitation in such data, there is evidence of increased incidences of PIH and associated fetal compromise in the sub Saharan and West African regions.

There is paucity of data in East Africa and particularly Tanzania pertaining to fetal compromise in relation to PIH, despite the marked fetal morbidity and mortality associated.

Muhimbili National Hospital per se, being the tertiary referral Hospital and the only public University Teaching Hospital in the country need to be equipped with sufficient information on the sonographic BPP among PIH patients.

The study aims at establishing baseline data of this condition, which will help to provide knowledge and subsequently filling the exiting gap in our set up.

Besides, ultrasound modality is widely available, covering up to remote areas and relatively affordable, thus, we hope the finding of this study will be useful to improve safe motherhood in the country.

1.5 RESEARCH QUESTIONS

1. What is the socio-demographic distribution of women with PIH attending MNH?
2. What are the sonographic biophysical profiles among women with PIH attending MNH?
3. What is the relationship between the socio-demographic factors and BPP among women with PIH attending MNH?
4. What is the relationship between the gestation age and BPP among women with PIH attending MNH?
5. What is the relationship between PIH management and BPP among women with PIH attending MNH?

1.6 OBJECTIVES

1.6.1 The main objective

To determine the sonographic biophysical profiles among women with PIH attending Muhimbili National Hospital (MNH)

1.6.2 Specific Objectives

1. To determine the sociodemographic distribution of women with PIH attending MNH from July 2013 to Dec 2013
2. To determine the patterns of BPP among women with PIH attending MNH from July 2013 to Dec 2013
3. To determine the relationship between the maternal socio-demographic factors and BPP among women with PIH attending MNH from July 2013 to Dec 2013
4. To determine the relationship between the gestation age and BPP of fetuses among women with PIH attending MNH from July 2013 to Dec 2013
5. To determine the relationship between PIH management and BPP among women with PIH attending MNH from July2013 to Dec 2013

CHAPTER TWO

2.0 RESEARCH METHODOLOGY

2.1 Study design

This was a descriptive, cross-sectional hospital based study that described the patterns of sonographic BPP of fetuses among patients with PIH attending MNH.

2.2 Study duration

The study was conducted from July 2013 to Dec 2013

2.3 Study area

Muhimbili National Hospital was the study area, using the Obstetric Ultrasound Unit and Antenatal Clinics.

Muhimbili National Hospital is a tertiary hospital located in Dar es Salaam, the leading commercial city in Tanzania, with estimated 4.5 million inhabitants according to the 2012 National census. It forms a regional referral hospital for the three municipal hospital namely; Amana Hospital in Ilala, Temeke Hospital in Temeke and Mwananyamala Hospital in Kinondoni district. On top of that the hospital receives referral cases from all over the country with 45 million populations. Lastly, the hospital serves as a teaching hospital for MUHAS.

The hospital has six obstetric wards located within the maternity block. It runs five maternity clinics every week, namely Firm I, Firm II, Firm III, Firm IV and IPPM. From the Hospital Medical Records, it is shown that about 500-600 pregnant women are seen per week, which equals 100-120 patients per working day.

2.4 Study population

Women with PIH attending clinic at MNH in the stated duration

Inclusion criteria

1. Pregnant women with PIH from 28 weeks of gestation to term
2. Patients in (1) above who will give a formal written informed consent

2.5 Exclusion criteria

The following categories were excluded from the study;

1. Pregnant women with PIH but too sick to participate in the study
2. Pregnant women with PIH but below 28 weeks of gestation
3. Refusal to consent

2.6 Sample size estimation

The minimum sample size was calculated based on the formula below

$N=Z^2*P(1-P)/E^2$

Where;

Z is the proportion of patients with PIH, 0.1[3,4,9,13,15]

E corresponds to maximum likely error of 0.05

Therefore, the minimum sample size was approximately;

$N=1.96^2x0.1(1-0.1)/0.05$

N=138.24

Considering 10% of possible non respondents/drop outs, that is 13.82, when added up, we got

The estimated sample size, N=152

2.7 Sampling technique

Patients were selected based on probability sampling by using convenient sampling technique, which recruits all candidates as they come. To get a total of 152 candidates within the specified time, 2-3 candidates were scanned per day.

2.8 Data collection

Closed ended structured questionnaires were used.

The information included socio-demographic data and the biophysical profiles of fetuses among pregnant women with PIH.

Data collection was done using a data collection tool stated above with the aid of the one research assistant who was trained with regards to this study so that as representative data as possible is achieved. The main duty of the research assistant was to organize the eligible candidates before BPP was performed, while the PI performed the sonography.

2.9 Parameters used for Fetal compromise on sonography

Parameter	Best score (2)	Poor score (0)
Fetal breathing movement	At least one episode of >20s in 30 minutes	None or less than 20s
Gross fetal movements	At least two movements of torso or limbs in 30minutes	Less than two movements
Fetal muscle tone	At least one episode of active bending and straightening of the limb or trunk in 30 minutes	No movement or sluggish or incomplete movement

Amniotic fluid volume	At least one vertical pocket measures >2cm vertically	Largest vertical pocket is < or =2cm

Ultrasound scan

The ultrasound modality was opted, using a portable ultrasound machine (MINDRY, Model DP- 2200, Shanghai). Scanning was performed using broadband curvilinear medium frequency transducer of 3.5 MHZ, which was routinely used at Muhimbili National Hospital.

On examination the patient lied on a supine position, with head elevated in a semi cardiac position to reduce the risk of compromising venous return by compressing the IVC. There were four criteria through which a score was calculated to establish each of the fetal wellbeing, namely; Fetal breathing movement, Fetal gross movements, Fetal muscle tone and Amniotic fluid index.

During scanning each candidate was regularly asked for any discomfort which could be related to the posture, so as to prevent hypotension attacks secondary to compromised venous return as pointed out above.

Each of variable was scored 2 points if present and 0 points if absent. No intermediate score was given. The first three variables assess immediate fetal health and the last is a measure of long-term fetal health.

The ultrasonography scanning was carried in the mid morning hours for all candidates so as to offset the possible differences in the BPP due to the Circadian rhythm as outlined in the introduction.

Qualitycontrol

All ultrasonic reports that were obtained have been stored in hard copies. The reports have been proof read by the investigator under the guidance of the Consultant Radiologist so as to offset bias in observations and ensure quality.

2.10 Data management

All filled questionnaires were daily checked for completeness and accuracy by the Investigator and then coded before entering the data into the software. Data was entered in the Statistical Package for Social Sciences (SPSS) version 20. Double entry of at least 15% of the questionnaires was done to ensure correct entry. Statistical analysis was performed using frequency distribution and cross tables were used to tabulate data. Association between categorical variables was done using Pearson's Chi squire. Dichotomous variables and continuous variables were assessed using t-tests and continuous against continuous by Pearson's correlation coefficient. All analysis was set at 95% level of confidence.

2.11 Ethical clearance

Ethical Clearance was be obtained from MUHAS-IRB (Institutional Review Board) and permission to conduct the study at MNH using the Antenatal clinic and imaging facility was be obtained from Director of clinical services of MNH.

Formal Informed written consents were obtained from the eligible candidates prior to recruitment for the study.

Confidentiality was observed during the whole process of the research, whereby, as the Principal Investigator, I carried all the ultrasound procedures and coded the data.

Patients who were eligible but refused to participate in the study were not deprived of their rights to receive medical attention they needed.

2.12 Disposal of study patients and results

All results obtained from the study will be readily available to the obstetricians looking after the patients to continue with standard care as per MNH management guideline.

Production of the dissertation that will be available in the medical library of MUHAS for reference.

Publication of the research findings in a medical journal and presentation of research in scientific conferences.

2.13 Study Limitations

Being hospital based, the findings of this study cannot be generalized to the population

CHAPTER THREE

RESULTS

Table 1.1: Frequency distribution by Maternal and Gestation age groups

Variable	Frequency	Percentage
Maternal Age groups		
16-20	13	8.6
21-25	40	26.3
26-30	49	32.2
31-34	37	24.3
35 and above	13	8.6
Total	152	100
Gestation Age groups		
28-31	50	32.9
32-35	55	36.2
Above 35	47	30.9
Total	152	100

Majority of the candidates were aged between 26-30(32.2%), and had gestation age between 32-35 (36.2%)

Table 1.2: Frequency distribution by marital status

Marital status	Frequency	Percentage
Single	32	21.1
Cohabiting	23	15.1
Married	95	63.8
Total	152	100

Majority of respondents were married (63.8%)

Table 1.3: Frequency distribution by the level of education and employment

Education level	Frequency	Percentage
Primary School	20	13.2
Secondary School	70	46.1
Higher learning	62	40.7
Total	152	100
Employment		
Formal employment	75	49.3
Self-employment	50	32.9
Unemployed	27	17.8
Total	152	100

Majority of participants had secondary education (46.1%), and employment (49.3%)

Table 2.1: Biophysical profile abnormality by maternal age

Variables	Biophysical Profile abnormality				
	Yes(%)	**No(%)**	**Total(%)**	**X^2(df)**	**P-value**
Age Groups					
16-20	3(23.1)	10(76.9)	13(100)	1.96(4)	0.74
21-25	7(17.5)	33(82.5)	40(100)		
26-30	8(16.3)	41(83.7)	49(100)		
31-35	4(10.8)	33(89.2)	37(100)		
Above 35	1(7.7)	12(92.3)	13(100)		
Total	23(15.1)	129(84.9)	152(100)		

BPP abnormality occurred more in the candidates aged between 16-20 (23.1%)

Table 2.2: Biophysical profile abnormality by Gestation age groups

Gestational Age Groups	Biophysical abnormality				
	Yes(%)	No(%)	Total(%)	X2(df)	P-value
28-31	6(12.0)	44(88.0)	50(100)	3.65(2)	0.16
32-35	6(10.9)	49(89.1)	55(100)		
Above 35	11(23.4)	36(76.6)	47(100)		
Total	23(15.1)	129(84.9)	152(100)		

BPP abnormality occurred more in the candidates with gestation age group above 35 weeks (23.4%)

Table 2.3: Biophysical profile abnormality by marital status

Marital status	Biophysical profile abnormality			X2(df)	P-value
	Yes(%)	No(%)	Total(%)		
Single	5(15.6)	27(84.4)	32(100)	8.68(2)	0.01
Cohabiting	8(34.8)	15(65.2)	23(100)		
Married	10(10.3)	87(89.7)	97(100)		
Total	23(15.1)	129(84.9)	152(100)		

BPP abnormality occurred significantly among cohabiting candidates (34.8%, p=0.01)

Table 3.1: Comparison between Blood pressure and fetal movements

Blood Pressure (BP)	Reduced fetal movements		Total(%)	X^2(df)	P-value
	Yes(%)	No(%)			
Uncontrolled BP	4(3.0)	128(97.0)	132(100)	0.21(1)	0.65
Controlled BP	1(5.0)	19(95.0)	20(100)		
Total	5((4.6)	147(95.4)	152(100)		

Normal fetal movements were observed comparatively equal between the controlled and uncontrolled blood pressures (97.0% vs 95.0), p=0.65

Table 3.2: Comparison between Blood pressure and fetal tone

	Reduced fetal tone		Total(%)	X^2(df)	P-value
	Yes(%)	No(%)			
Uncontrolled BP	6(4.5)	126(95.5)	132(100)	0.008(1)	0.93
Controlled BP	1(5.0)	19(95.0)	20(100)		
Total	7((4.6)	145(95.4)	152(100)		

No remarkable differences seen in fetal tone between the groups

Table 3.3: Comparison between Blood pressure and fetal breathing movement

	Reduced fetal breathing		Total(%)	X^2(df)	P-value
	Yes(%)	No(%)			
Uncontrolled BP	11(8.3)	121(91.7)	132(100)	1.79(1)	0.18
Controlled BP	1(5.0)	19(95.0)	20(100)		
Total	12((7.2)	140(92.8)	152(100)		

Slightly higher percentage of reduced fetal breathing movements was observed in the uncontrolled BP group (8.3% vs5.0%), P=0.18

Table 3.4: Comparison between Blood pressure and amniotic fluid volume

	Reduced amniotic fluid volume		Total(%)	X^2(df)	P-value
	Yes(%)	No(%)			
Uncontrolled BP	3(2.3)	123(97.7)	132(100)	3.26(1)	0.07
Controlled BP	2(10.0)	18(90.0)	20(100)		
Total	5((3.3)	147(96.7)	152(100)		

Only 5 candidates had reduced AFV in the controlled and uncontrolled blood pressure groups combined

Key:

Controlled BP=less than 140mmHg systolic BP, and less than 90 mmHg diastolic

Uncontrolled BP=either systolic BP is 140 or above, or diastolic BP is 90mmHg or above.

Table 4: Relationship between Blood Pressure, the use of antihypertensives and Biophysical profiles

Blood Pressure	**Biophysical Profile derangement**		Total(%)	X^2(df)	P-value
	Yes(%)	No(%)			
Uncontrolled BP	20(15.2)	112(84.8)	132(100)	0.001(1)	0.99
Controlled BP	3{15.0)	17(85.0)	20(100)		
Total	23(15.1)	129(84.9)	152(100)		
Medications					
Not on anti-hypertensives	7(12.7)	48(87.3)	55(100)	0.39(1)	0.53
On anti-hypertensives	16(16.5)	81(83.5)	97(100)		
Total	23(15.1)	129(84.9)	152(100)		

There is no significant observed differences in biophysical profiles between the uncontrolled and controlled Blood Pressure groups, as well as those on hypertensives and not on antihypertensives.

Table 5: Relationship between Blood Pressure and severity of BPP scores

BPP	Systolic BP		TOTAL	P-value
	More than 140 (%)	Less than 140 (%)		
4	3(60)	2(40)	5(100)	0.206
6	15(83.3)	3(16.7)	18(100)	
8	82(63.6)	47(36.4)	129(100)	
TOTAL	100 (65.8)	52(34.2)	152(100)	
	Diastolic BP			
	More than 90 (%)	Less than 90 (%)		
4	4(80)	1(20)	5 (100)	0.603
6	11(61.1)	7(38.9)	18(100)	
8	89(69.0)	40(31.0)	129(100)	
TOTAL	104(68.4)	48(31.6)	152(100)	

The lowest BPP were observed more in the Systolic BP above 140mmHg and Diastolic BP above 90mmHg, however, the observation is attributed to chance observation (P>0.05)

Table 6: Gestation Age by dates correlating with Gestation Age by Ultrasound and Estimated fetal weight

	Gestation Age by dates	
	Pearson correlation	**P-value**

Estimated Gestation Age by Ultrasound	0.866	0.001
Estimated fetal weight by Ultrasound	0.820	0.001

There is high correlation between the gestation age by dates and the sonographically estimated gestation age and fetal weight

CHAPTER FOUR

4.0 DISCUSSION

Pregnancy induced hypertension is fairly common at the ANC setting[13].

Among other complications, PIH may progress to pre-eclampsia and ecclampsia with severely poor maternal and fetal sequela[14].

It was found from the study that the studied population ranged from 18 to 41 years of age with the mean of 28 years, median of 28 years and mode of 25 years. This reflects the reproductive age group as shown in another study[43].

This study reveals that maternal age is not a risk factor for fetal compromise due to PIH[18].

The study also reveals that there is significant difference between the cohabiting women and the married women or single women, when it comes to fetal wellbeing, the poor BPP was observed more in the former[39].

It was found that Blood pressure differences did not cause significant difference in the BPP. However, when considered individually, the study shows that there is non-significant reduction in fetal breathing movements among candidates with uncontrolled blood group (8.3%). This is similarly reflected in previous studies[22].

Moreover, the study showed that the lowest BPP were observed more in the Systolic BP above 140mmHg and Diastolic BP above 90mmHg, however, the observation is attributed to chance observation. This is supported by previous studies[41,42].

Likewise, the use of antihypertensives showed no added advantage in terms of the BPP compared to the non-using group, this finding contradicts the findings in previous studies[38,40].

CONCLUSION

BPP is a useful tool for testing fetal wellbeing, however, it was limited when dealing with mild to moderate PIH. No significant relationship was observed between mild PIH and poor BPP

Low maternal age was related with poor BPP

As gestation age advanced, the BPP worsened

Confounding factors play a role in the BPP, for instance, cohabiting pregnant women

RECOMMENDATION

All pregnant women diagnosed to have PIH need to undergo routine BPP for fetal surveillance, also to include patients with severe PIH/Pre ecclampsia who most likely will benefit more

BPP to be carried out together with other parameters of fetal surveillance like umbilical artery Doppler evaluation to increase sensitivity to early hypoxic changes in utero.

There is a need for early delivery of pregnant women with PIH

There is a need to discourage teenage pregnancy

Bigger, community based studies are recommended in order to follow up on the studied subjects so as to establish association between PIH and BPP.

REFERENCES

1. Freeman RK. Antepartum testing in patients with hypertensive disorders in pregnancy. Seminars in Perinatology. 2008 Aug;32(4):271-3.
2. Ogweyo, PA. Pathogenic mechanisms in pre-eclampsia and eclampsia at Muhimbili National hospital Dar es Salaam Tanzania. Muhimbili University of Health and Allied Sciences, Institutional Repository. 2009
3. López-Jaramillo, Patricio; García, Ronald G; López, Marcos. Preventing pregnancy-induced hypertension: are there regional differences for this global problem? Journal of Hypertension: June 2005; 23:1121-1129.
4. Guimarães Filho HA, Araujo Júnior E, Nardozza LM, Dias da Costa LL, Moron AF, Mattar R. Ultrasound assessment of the fetal biophysical profile: what does the radiologist need to know? European Journal of Radiology. 2008 Apr;66(1):122-6.
5. Nomura RM, Miyadahira S, Zugaib M. Antenatal fetal surveillance. Revised Brazilian Gynecology and Obstetrics. 2009 Oct;31(10):513-26.
6. Chousawai S, Tongprasert F, Yanase Y, Udomwan P, Tongsong T. The efficacy of rapid biophysical profile in predicting poor pregnancy outcomes in suspected intrauterine growth restriction fetuses: preliminary study. Journal of the Medical Association of Thailand. 2012 Apr;95(4):482-6.
7. Tyrone D. Cannon, Theo G. M. van Erp, Isabelle M. Rosso, Matti Huttunen, Jouko Lönnqvist, Tiia Pirkola, Oili Salonen, Leena Valanne, Veli-Pekka Poutanen, Carl-Gustav Standertskjöld-Nordenstam. Fetal Hypoxia and Structural Brain Abnormalities in Schizophrenic Patients, Their Siblings, and Controls. Archives of General Psychiatry. 2002;59(1):35-41.
8. Ullah N, Usman M, Khan AR. Sonographic biophysical profile in detection of foetal hypoxia in 100 cases of suspected high risk pregnancy. Journal of Ayub Medical College Abbottabad. 2010 Jul-Sep;22(3):77-80.
9. Lalor J, Devane D. Using the biophysical profile to assess fetal wellbeing. The Journal of Practising Midwife. 2010 Jun;13(6):16-7.

10. Enis Ozkaya, Eralp Baser, Mehmet Cinar, Vakkas Korkmaz, Tuncay Kucukozkan. Does diurnal rhythm have an impact on fetal biophysical profile? Journal of Maternal-Fetal and Neonatal Medicine. April 2012; 25(4):335-338.
11. Lalor JG, Fawole B, Alfirevic Z, Devane D. Biophysical profile for fetal assessment in high risk pregnancies. Cochrane Database of Systematic Reviews. 2008 Jan 23;(1).
12. Malcus P. Antenatal fetal surveillance. Current Opinion in Obstetrics and Gynecology. 2004 Apr;16(2):123-8.
13. Itoo BA, Al-Hawsawi ZM, Khan AH. Hypoxic ischemic encephalopathy. Incidence and risk factors in North Western Saudi Arabia. The Journal of Neurosciences (Riyadh). 2003 Apr;8(2):113-9.
14. Odibo AO, Quinones JN, Lawrence-Cleary K, Stamilio DM, Macones GA. What antepartum fetal test should guide the timing of delivery of the preterm growth-restricted fetus? A decision-analysis. American Journal of Obstetrics and Gynecology. 2004 Oct;191(4):1477-82.
15. Spiegler J, Stichtenoth G, Weichert J, König IR, Schlaud M, V D Wense A, Olbertz D, Gurth H, Schiffmann JH, Bohnhorst B, Gortner L, Herting E, Göpel W. Pregnancy risk factors for very premature delivery: what role do hypertension, obesity and diabetes play? The German Neonatal Network, GNN. Archives of Gynecology and Obstetrics. 2013 Feb 12.
16. Joey P. Granger, Barbara T. Alexander, William A. Bennett, Raouf A. Khalil. Pathophysiology of pregnancy-induced hypertension. American Journal of Hypertension. 2001;14:178–185.
17. Xu Xiong, Damon Mayes, Nestor Demianczuk, David M. Olson, Sandra T. Davidge, Christine Newburn-Cook, and L. Duncan Saunders. Impact of pregnancy-induced hypertension on fetal growth. American Journal of Obstetrics and Gynecology. 1999;163:1689-1712.
18. Walton JR, Peaceman AM. Identification, assessment and management of fetal compromise. Clinics in Perinatology. 2012 Dec; 39(4):753-68.

19. Salako BL, Aimakhu CO, Odukogbe AA, Olayemi O, Adedapo KS. A review of hypertensive disorders of pregnancy. African Journal of Medicine and Medical Sciences. 2004 Jun;33(2):99-103.
20. Jain L. Effects of pregnancy-induced and chronic hypertension on pregnancy outcome. Journal of Perinatology. 1997 Nov-Dec;17(6):425-7.
21. Devoe LD. Antenatal fetal assessment: contraction stress test, nonstress test, vibroacoustic stimulation, amniotic fluid volume, biophysical profile, and modified biophysical profile--an overview. Seminars in Perinatology. 2008 Aug;32(4):247-52.
22. Turan S, Miller J, Baschat AA. Integrated testing and management in fetal growth restriction. Seminars in Perinatology. 2008 Jun;32(3):194-200.
23. Jodicke C, Maulik D, Singh P, Heitmann E, Maulik D. Role of ultrasound in pre-eclampsia. Minerva Gynecology. 2012 Aug;64(4):293-308.
24. Compitak K, Pheungtavechok O. Diagnostic performance of a modified biophysical profile for fetal acidemia in high-risk pregnancies. Journal of the Medical Association of Thailand. 2004 Oct;87(3):12-7.
25. Norman W. Rantanen. Biophysical Profile (BPP) on Diagnostic Ultrasound, The clinics of North America. Equine practice. Jaypee Brothers Publishers, 1986;2(39).
26. Oyelese Y, Vintzileos AM. The uses and limitations of the fetal biophysical profile. Clinics in Perinatology. 2011 Mar;38(1):47-64.
27. Grivell RM, Wong L, Bhatia V. Regimens of fetal surveillance for impaired fetal growth. Cochrane Database of Systematic Reviews. 2009 Jan 21;(1)
28. Kaur S, Picconi JL, Chadha R, Kruger M, Mari G. Biophysical profile in the treatment of intrauterine growth-restricted fetuses who weigh <1000 g. American Journal of Obstetrics and Gynecology. 2008 Sep;199(3):264.
29. Magann EF, Doherty DA, Field K, Chauhan SP, Muffley PE, Morrison JC. Biophysical profile with amniotic fluid volume assessments. Obstetrics and Gynecology. 2004 Jul;104(1):5-10.
30. Kim SY, Khandelwal M, Gaughan JP, Agar MH, Reece EA. Is the intrapartum biophysical profile useful? Obstetrics and Gynecology. 2003 Sep;102(3):471-6.

31. Phattanachindakun B, Boonyagulsrirung T, Chanprapaph P. The correlation in antepartum fetal test between full fetal biophysical profile (FBP) and rapid biophysical profile (rBPP). Journal of the Medical Association of Thailand. 2010 Jul;93(7):759-64.
32. Tongprasert F, Jinpala S, Srisupandit K, Tongsong T. The rapid biophysical profile for early intrapartum fetal well-being assessment. International Journal of Gynaecology and Obstetrics. 2006 Oct;95(1):14-7.
33. Nguku SW, Wanyoike-Gichuhi J, Aywak AA. Biophysical profile scores and resistance indices of the umbilical artery as seen in patients with pregnancy induced hypertension. East African Medical Journal. 2006 Mar;83(3):96-101.
34. Berenson AB, Wiemann CM, McCombs SL. Adverse perinatal outcomes in young adolescents. Journal of Reproductive Medicine. 1997 Sep;42(9):559-64.
35. Maembe, L. E. Management of preeclampsia/eclampsia in Dar es Salaam public health facilities: availability of supplies and knowledge of healthcare workers. Muhimbili University of Health and Allied Sciences, Institutional Repository. 2012.
36. Faúndes A, Pires P, Albuquerque R. The value of a clinical fetal biophysical profile in high risk pregnancies. International Journal of Gynaecology and Obstetrics. 2000 Dec;71(3):235-6.
37. H. Korkes, L.G. Oliveira, L. Berlinck, A.F. Borges, F. Sampaio Goes, S. Watanabe, C. Landman, N. Sass. Human fetal malformations associated with the use of angiotensin II receptor antagonist. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*. 2009;2(3):314-315.
38. Deak TM, Moskovitz JB. Hypertension and pregnancy. The Journal of Emergency Medical Clinics of North America. 2012 Nov; 30(4):903-17.
39. Lawrence B. Finer, Stanley K. Henshaw. Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. The Journal of Perspectives on Sexual and Reproductive Health. June, 2006(38):2
40. Thompson JL, Kuller JA, Rhee EH. Antenatal surveillance of fetal growth restriction. Obstetrics and Gynecology Surveillance. 2012 Sep;67(9):554-65.

41. Maulik D. Management of fetal growth restriction: an evidence-based approach. Clinical Obstetrics and Gynecology. 2006 Jun;49(2):320-34.
42. Vintzileos AM. Antenatal assessment for the detection of fetal asphyxia. An evidence-based approach using indication-specific testing. Annals of the New York Academy of Sciences. 2000;900:137-50.
43. Nkrumbih, Z. Fetal biometric measurement reliability on estimating gestation age among normal pregnant women attending antenatal clinic at Muhimbili National Hospital. Muhimbili University of Health and Allied Sciences, Institutional Repository. 2010

APPENDICES

Appendix I: Informed Consent to Participate in the Research

Introduction and goals

The goal of this study is establish the Sonographic biophysical profiles among patients with Pregnancy Induced Hypertension attending Muhimbili National Hospital, in the stated period of time

The participation is free and voluntary. If you decide not to participate in the research it will not affect the access to the health services at any health facility in the United Republic of Tanzania including MNH.

Benefits

The participants who will be in potential risk of having unpleasant outcome of pregnancy, if the pregnancy is carried to term; they will benefit from early intervention to prevent the risk.

There is no financial gain; rather, they will know the status of the babies in utero

Voluntary participation is encouraged and appreciated

Risks

The participants are not exposed to any risks by taking part in this research.

Ultrasonography is free from ionizing radiations and poses no risk to the mother and the baby

Confidentiality

The information obtained from this research will be confidential and will only be used for scaling up safe motherhood particularly at risk posed by pregnancy induced hypertension

Since coding is used throughout the study, confidentiality is guaranteed

DR HIMIDI MWAITELE

Signature …… Principal Investigator

Communication

For any query concerning this research, please do not hesitate to contact

DR HIMIDI MWAITELE, The principal investigator, Muhimbili University of Health and Allied Sciences (MUHAS). P.O Box 65013. Mobile +255 713 670 306

If you have queries concerning your rights as a participant in the research, please contact:

Prof. Mainen Moshi, The Director of research and publications

Muhimbili University of Health and Allied Sciences (MUHAS).

P.O Box 65001 Dar es salaam. Tel.2151489.

Looking forward to your voluntary participation in this study.

I…… (Participant)

I have read and understood the information provided to me as it is written also my questions have been well answered by the investigator. I personally agree and consent to participate in this research.

Name of Participant ……..Tel…….
Signature……(Participant)
Date……

Appendix II: Ridhaa ya Kushiriki katika Utafiti

Utangulizi

Lengo la utafiti huu ni kujua hali halisi ya tatizo la kukosa oksijeni ya kutosha kwa watoto walio tumboni mwa kina mama wajawazito wanaokabiliwa na shinikizo la damu kutokana na ujauzito husika.

Ushiriki katika utafiti huu ni hiyari. Iwapo utaamua kutoshiriki kwenye utafiti, haitaathiri huduma upatazo katika hospitali ya MNH au hospitali nyingine yoyote.

Faida

Kina mama ambao watoto wao wataonekana kuwa katika hatari ya kukosa oksijeni kutokana na shinikizo la damu kwa mama; ambalo linaweza kupelekea wakazaliwa na matatizo, maamuzi yatafanyika ili mama ajifungue mapema zaidi ili kumnusuru mtoto.

Wakati huo huo kina mama watakaopimwa watapata faida ya kujua maendeleo ya watoto wao kwa ujumla kwa kutumia mashine ya Ultrasound

Hakuna mafao ya kifedha kutokana na ushiriki huu.

Ushiriki huu ni wa hiyari lakini tunatambua na kuthamini ushiriki wako

Madhara

Ultrasound ni kipimo kisicho na mionzi, hakuna madhara yoyote kwa mama wala mtoto kutokana na ushiriki wako katika utafiti huu

Usiri

Taarifa zote zipatikanazo kutokana na utafiti huu zitatunzwa kwa usiri mkubwa na zitatumika kuboresha huduma ya mama mjamzito na uzazi salama pamoja na hatari zitokanazo na shinikizo la damu wakati wa ujauzito.

Natanguliza shukrani zangu za dhati kwa utayari wako wa kushiriki utafiti huu.

DR HIMIDI MWAITELE,

Sahihi ……..... Mtafiti

Mawasiliano

Kwa maswali yoyote yahusuyo utafiti, tafadhali usisite kuwasiliana na mtafiti DR HIMIDI MWAITELE simu ya mkononi +255 713 670 306, Chuo Kikuu cha Afya na Sayansi za Tiba (MUHAS) SLP 65013.

Iwapo una swali juu ya haki yako kama mshiriki katika utafiti wasiliana na:

> Prof. E.F Lyamuya, Mkurugenzi wa machapisho na utafiti, S.L.P 65001 Dar es salaam. Simu .2151489.

Mimi ……..... (Mshiriki)

Nimesoma na kuelewa habari zilizotolewa kwangu kama zilivyoandikwa na pia nimejibiwa maswali yangu kwa usahihi na mtafiti. Mimi bila kushawishiwa nimekubali kushiriki katika utafiti huu.

Jina la Mshiriki …….. SIMU……

Sahihi…… (Mshiriki)

Tarehe…….....

Appendix III: English Questionnaire

PART I: SOCIO-DEMOGRAPHIC DATA

Registration no.....

Date of interview.....

Blood pressure……..

1. Age.....
2. Gestation Age
3. Education level
    a. Primary School
    b. Secondary School
    c. Higher Learning
    d. No formal education
4. Marital status
    a. Single
    b. Cohabiting
    c. Married
    d. Divorced

e. Widowed

5. Employment

a. Formal employment

b. Self employment

c. Unemployed

6. Are you on Antihypertensives

1. Yes (for how long?……)

2. No

PART II: IMAGING DATA (INVESTIGATOR)

7. Is there Sonographic biophysical profile abnormalities

1. Yes

2. No

8. Pattern of abnormality; Reduced fetal tone

1. Yes

2. No

9. Reduced fetal movements

1. Yes

2. No

10. Reduced fetal breathing

1. Yes

2. No

11. Reduced amniotic fluid index

    1. Yes

    2. No

12. Biophysical profile scores

    a. 2
    b. 4
    c. 6
    d. 8

13. Fetal biometrics

a. Biparietal diameter (BPD)……..……..

b. Head circumference (HC)……

c. Femur length (FL)……....

d. Abdominal circumference (AC)……

14. Sonographic gestation age……

15. Estimated fetal weight in grams…….