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Research paper

Factors associated with adverse pregnancy outcomes among women who delivered at intermediate hospital oshakati, Namibia

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Abstract

Background: Globally, the leading cause of death among females aged 15-49 years old is maternal mortality. More than 1,500 women die each day from pregnancy related causes resulting in an estimated 550,000 maternal deaths annually. We identified risk factors associated with adverse pregnancy outcomes.
Methods: We conducted a descriptive, cross-sectional study, in which we administered a structured questionnaire through face to face interviews. We also applied the multivariate logistic regression model to determine factors associated with adverse pregnancy outcomes.
Results: We enrolled a total of 306 pregnant women of whom 50% (n=153) were 12-19 years old and 50% (n=153) were 20-45 years old. Maternal death occurred only in the 20-45 years old mothers (6/153, 3.9%). In multivariate analysis, living in a rural area (aOR2.00, 95% CI: 1.08 to 3.69, p=0.027), shorter gestational period [32-37 weeks] (aOR4.84, 95% CI: 2.31 to 10.14, p=0.0007), haemoglobin level <10gm% (aOR3.87, 95%CI: 1.79 to 8.39, p=0.001), obesity [BMI ≥ 30 kg/m^2] (aOR4.89, 95% CI: 1.38 to 17.37, p=0.014) and moderately high blood pressure [SBP/DBP of 150/100-159/109] (aOR15.15, 95% CI: 1.78 to 128.68, p=0.013) were significantly associated with adverse pregnancy outcomes.
Conclusion: In this study, we identified living in a rural area, shorter gestational period, haemoglobin level < 10gm%, obesity, and having moderately high blood pressure to be risk factors for adverse pregnancy outcomes. All the maternal deaths were in the 20-45 years old pregnant mothers. We recommend educating women on these risk factors in order to reduce the burden of adverse pregnancy outcomes.

Keywords: *Adverse Pregnancy Outcomes; Intermediate Hospital Oshakati; Angola; Namibia.*

1. Introduction

Globally, the leading cause of death among females aged 15-49 years old is maternal mortality. More than 1,500 women die each day from pregnancy related causes resulting in an estimated 550,000 maternal deaths annually (U.N.General Assembly, 2009). In 2010, the WHO, UNICEF, UNFPA and the World Bank estimated that about 260 women die per 100 000 live births worldwide, and most of these deaths occur in developing countries particularly in the Sub-Saharan Africa. These estimates indicate that Africa recorded the highest Maternal Mortality Ratio (MMR) of 620 per 100,000 live births, whilst Europe recorded the lowest maternal mortality rate of 16 per 100,000 live births (WHO, 2012). Namibia recorded 113 maternal deaths from 1st January 2008 to 31st May 2010 (MoHSS, 2011). In order to reduce maternal mortality (MM), the Sustainable Development Goal (SDG 3) of ensuring healthy lives and promoting well-being for all has been proposed (UNICEF, 2008).
Maternal mortality is one of many adverse pregnancy outcomes. The other adverse pregnancy outcomes (APOs) include preterm birth, neonatal and perinatal death, postpartum haemorrhage, puerperal sepsis, pre-eclampsia or eclampsia, caesarean section, low birthweight, foetal death/stillbirth (Winthrop-University Hospital, 2015). Neonatal mortality in a neighbouring country, Botswana, was estimated at 46 per 1,000 live births in 2004 (UNICEF, 2008). More recent studies conducted at community-level in Burkina Faso have reported perinatal mortality of 32 per 1000 in Houndé (Roberfroid, et al.2008), A study conducted in Nigeria reported that puerperal sepsis is a second leading cause of death accounting for 26.3% of maternal deaths (WHO, 2010).
The burden of adverse pregnancy outcomes is high in Namibia. Out of a total of 10, 446 births recorded in Intermediate Hospital Oshakati, Oshana region, Namibia, in 2011 to 2013, there were 34 maternal deaths (0.3%), 369 neonatal deaths (3.5%), 403 perinatal deaths (3.9%), 879 premature births (8.4%), 2,448 caesarean sections (23.4%) (Intermediate Hospital Oshakati Report, 2011 to 2013). In 2013 alone, Oshana region recorded the highest number of maternal deaths, although it ranked sixth in the number of births in that year (MoHSS, 2014). In this study, we identified risk factors for APOs in a high maternal mortality Oshana region, Namibia, in order to inform strategies for reducing the burden of APOs in Namibia.

2. Methods

2.1. Study design

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We conducted a quantitative, descriptive, cross-sectional study from July – September 2015.

2.2. Setting

We conducted this study at Intermediate Hospital Oshakati (IHO) maternity ward, Oshana region, Namibia. IHO is one of the northern regional hospitals with a bed capacity of 768. The maternity ward has a bed capacity of 78 with an average of 100 babies delivered per week. It consists of 8 obstetric and 4 medical doctors, 37 registered and 15 enrolled midwife nurses. This hospital had the highest maternal deaths and child mortality in the region.

2.3. Participants

We included all pregnant women giving birth at Intermediate Hospital Oshakati during the period of study of four months.

2.4. Variable and measurements

We designed a pre-tested structured questionnaire for capturing all the variables. Section A included demographic characteristics of the pregnant mother: age, region, educational level, employment status, marital status, and residential area. Section B addressed potential risk factors: gravidity (number of pregnancy occurred), gestation (weeks of pregnancy), parity (number of children born alive), HIV status, body mass index (BMI), haemoglobin, and blood pressure (BP). Section C focused on patient outcomes: maternal death, perinatal death, neonatal death, postpartum haemorrhage, caesarean section, puerperal sepsis, eclampsia, low birth weight (<2500g), and others.
The HIV status was extracted from the pregnant mother's health record. The BMI of the mothers was taken using an electronic UNICEF Secca scale. The weight of the mothers was taken using a scale. The heights of the mothers were measured (in metres) while standing with their feet flat on the base of a special L-shaped, metal height measure. Heels, buttocks and backs were made to touch the backboard and the head was positioned so that the mother was looking directly forward. The BMI ranged as underweight (<18.5kg/m^2), normal weight (18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2) and obesity (>30kg/m^2). The electronic blood pressure (BP) apparatus was used to measure BP of the mothers, which ranged as normal (<140/90mmHg), mildly high (140/90 - 149/99mmHg), moderate high (150/100 - 159/109mmHg) and severely high (>160/110mmHg). The level of haemoglobin was taken using the electronic haemoglobin machine and was categorized as either <10gm% or >10gm%.

2.5. Data collection

We administered the questionnaire to each pregnant mother who delivered at Intermediate Hospital Oshakati during the study period. We conducted face to face interviews after making arrangements with the regional director, the hospital medical superintendent, the hospital nurse manager and supervisor for the maternity ward.

2.6. Bias

We conducted a pilot test prior to the actual data collection on pregnant mothers with similar characteristics to the sample and any unclear items were corrected. We assessed relevance and accuracy of the questionnaire in terms of information retrieval and relevance. We applied the multivariable logistic regression model in the analysis to account for any potential confounding bias.

2.7. Sample size

The sample size was 306 women delivering at Intermediate Hospital Oshakati during the study period.

2.8. Statistical methods

We used descriptive statistics to summarize the data which were presented as frequency distribution tables consisting of frequencies and percentages. We applied the multivariate logistic regression model to determine factors associated with adverse pregnancy outcomes and reported Odds Ratios (OR), 95% confidence intervals and p-values to demonstrate statistical significance. The dependent variable was any adverse pregnancy outcomes (maternal mortality, perinatal death, neonatal death, postpartum haemorrhage, puerperal sepsis, caesarean section or low birth weight) and the independent variables were the potential risk factors (sex, region, educational level, residential area, age, gravidity, gestation, parity, HIV status, BMI and hemoglobin).
We performed bivariate analysis first and entered all variables with p-values less than 0.2 in the multivariate analysis model. We used the manual forward stepwise procedure and used a cut off p-value of less than 0.05 for statistical significance. We ensured that only non-collinear variables were entered into the multivariate model by performing multicollinearity tests prior to adding variables into the model. We also applied the Hosmer-Lemeshow Chi-square goodness of fit test to assess the multivariate model. We captured data using Epi-Info version 7 (CDC, 2010) and used STATA version 12 in all statistical analyses.

2.9. Ethical issues

We obtained permission to conduct this study from the University of Namibia Postgraduate Studies Committee, the Namibia Ministry of Health and Social Services, and the Oshana Regional Director. We also obtained written informed consent from the study participants (mothers). We removed the participants identifying details (names and surnames) from the data set we used in the analysis.

3. Results

3.1. Demographic characteristics

We enrolled a total of 306 mothers who gave birth at the Intermediate Hospital Oshakati (IHO) during the study period. The mean (± SD) age of pregnant women participating in the study was 23 (±7.02) years and ranged from 12 years to 45 years. More than half of the cases were coming from Oshana region 162 (52.9%), followed by Omusati region 59 (19.3%), and the least majority were from Kunene region 6 (3.6%). Almost 90% of the participants 267 (87.3 %) were unemployed, while 39 (12.7%) were employed. More than ninety percent 286 (93.5%) were single, while 20 (6.5%) were married. About three quarters of the participants 232 (75.8%) were from rural areas, while 74 (24.2%) were residing in urban areas. Almost three quarters of participants had attended up to secondary school 228 (74.5%), followed by primary education 45 (14, 7 %), while the least of participants attended tertiary education 11 (3.6%) (Table 1).

3.2. Adverse pregnancy outcomes

Out of the 306 mothers enrolled in the study, a total of 164 (53.59%) experienced an adverse pregnancy outcome (maternal death, neonatal death, perinatal death, postpartum haemorrhage, puerperal sepsis, eclampsia, caesarean section, or low birthweight). We found six maternal deaths [all in mothers aged 20-45 years] (1.96%), four neonatal deaths (1.31%), nine (2.94%) perinatal deaths (five fresh still births and four macerated deaths), 20 postpartum haemorrhages (6.54%), one puerperal sepsis (0.33%), 28 eclampsia (9.15%), 100 caesarean sections (32.68%), and 66 low birth weight babies (21.57%) (Table 3).

Table 1: Socio-Demographic Characteristics of Women who delivered at Intermediate Hospital Oshakati, Namibia, July - September 2015

Characteristics	Frequency	Percentage %
Age:		
12-15	11	3.5
16-19	142	46.4
20-23	41	13.4
24-27	31	10.1
28-31	29	9.4
32-35	25	8.1
36-45	27	8.8
Region:		
Kunene	7	2.2
Non –Namibian (Angolan)	22	7.1
Ohangwena	47	15.3
Omusati	61	19.9
Oshana	158	51.6
Oshikoto	11	3.5
Employment:		
Employed	39	13
Unemployed	267	87
Marital Status:		
Married	20	7
Single	286	93
Residential area:		
Urban	232	76
Rural	74	24
Educational level:		
No formal education	22	7.19
Primary education	45	14.71
Secondary	228	74.51
Tertiary	11	3.59

Table 3: Adverse Pregnancy Outcomes of Women who delivered at Intermediate Hospital Oshakati, Oshana Region, Namibia, July – September 2015

Characteristics	Frequency (n)	Percentage (%)
Maternal death	6	1.96
Neonatal death	4	1.31
Postpartum Haemorrhage	20	6.54
Puerperal sepsis	1	0.33
Eclampsia	28	9.15
Caesarean Section	100	32.68
Low birth weight	66	21.57
Fresh still birth	5	1.63
Macerated	4	1.31
None	72	23.52
Total	306	100.00

3.3. Factors associated with adverse pregnancy outcomes

In multivariate analysis, mothers living in a rural area were twice more likely to have an adverse pregnancy outcome compared to mothers living in an urban area (adjusted Odds Ratio [aOR] 2.00, 95% CI: 1.08 to 3.69, p=0.027). We also found that mothers having shorter gestational period [32-37 weeks] were almost five times more likely to suffer an adverse pregnancy outcome compared to longer gestational period [38 -42 weeks] (aOR4.84, 95% CI: 2.31 to 10.14, p=0.0007). Our findings also indicate that mothers with lower levels of haemoglobin (<10 gm%) were almost four times more likely to have an adverse pregnancy outcome (aOR3.87, 95%CI: 1.79 to 8.39, p=0.001). Our results for body mass index (BMI) show that obese mothers [BMI ≥ 30 kg/m^2] were almost five times more likely to have an adverse pregnancy outcome, compared to mothers having normal weight [BMI 18.5 – 24.9 kg/m^2] (aOR4.89, 95% CI: 1.38 to 17.37, p=0.014). Finally, our results from the blood pressure measurements showed that mothers having moderately high blood pressure [Systolic/ Diastolic Blood Pressure (SBP/DBP): 150/100 – 159/109 mmHg] were 15 times more likely to have an adverse pregnancy outcome compared to mothers having normal blood pressure [SBP/DBP ≤ 140/90 mmHg] (aOR15.15, 95% CI: 1.78 to 128.68, p=0.013). Age, region, employment status, marital status, education level, gravidity, parity and HIV status were not associated with having adverse pregnancy outcome (Table 2).

Table 2: Multivariate Analyses on Potential Risk Factors of Women who delivered t Intermediate Hospital Oshakati, Namibia, July – September 2015

Risk Factor	Adverse Pregnancy Outcome, N (%)		Univariate analysis			Multivariate analysis		
	No	Yes	OR	95%CI	P	aOR	95%CI	P
Age, years								
12-19	69 (49.1)	84 (54.9)	1					
20-45	73 (47.7)	80 (52.3)	0.90	0.57 - 1.41	0.647			
Region								
Kunene	3 (50.0)	3 (50.0)	1					
Angola	5 (22.7)	17 (77.3)	3.40	0.52 - 22.41	0.203			
Ohangwena	19 (41.3)	27 (58.7)	1.42	0.26 - 7.81	0.686			
Omusati	19 (32.2)	40 (67.8)	2.11	0.39 - 11.42	0.388			
Oshana	91 (56.2)	71 (43.8)	0.78	0.15 - 3.98	0.153			
Oshikoto	5 (45.5)	6 (54.5)	1.20	0.16 - 8.80	0.164			
Employment								
No	124 (46.4)	143 (53.6)	1					
Yes	18 (46.2)	21 (53.9)	1.01	0.52 - 1.98	0.973			
Marital Status								
Married	9 (45.0)	11 (55.0)	1					
Single	133 (46.5)	153 (53.5)	0.94	0.38 - 2.34	0.896			
Education level								
No formal education	7 (31.8)	15 (68.2)	1					
Primary education	15 (33.3)	30 (66.7)	0.93	0.31 - 2.78	0.901			
Secondary education	116 (50.9)	112 (49.1)	0.45	0.18 - 1.15	0.094			
Tertiary education	4 (36.4)	7 (63.6)	0.82	0.18 - 3.74	0.794			
Residential area								
Urban	46 (62.2)	28 (37.8)	1			1		
Rural	96 (41.4)	136 (58.6)	2.33	1.36 - 3.98	0.002	2.00	1.08- 3.69	0.027
Gestation, weeks								
38-42	129 (58.4)	117 (47.6)	1			1		

32-37	12 (21.8)	43 (78.2)	3.95	1.99 - 7.85	<0.001	4.84	2.31- 10.14	0.000
26-31	1 (20.0)	4 (80.0)	4.41	0.49 - 40.02	0.187	4.71	0.46-48.46	0.193
Haemoglobin								
>10 mg%	131 (50.0)	131 (50.0)	1			1		
<10mg%	11 (25.0)	33 (75.0)	3.00	1.45 – 6.19	0.003	3.87	1.79 - 8.39	0.001
Body Mass Index								
Normal	92 (42.0)	117 (56.0)	1			1		
Obese	4 (26.7)	11 (73.3)	2.16	0.67 - 7.01	0.199	4.89	1.38– 17.37	0.014
Overweight	38 (58.5)	27 (41.5)	0.56	0.32 - 0.98	0.043	0.84	0.45 - 1.58	0.591
Underweight	8 (47.1)	9 (52.9)	0.88	0.33 – 2.38	0.808	1.18	0.40 - 3.45	0.764
Blood Pressure								
Normal	136 (51.5)	128 (48.5)	1			1		
Mildly high	5 (35.7)	9 (64.3)	1.91	0.62 - 5.86	0.256	2.28	0.69 - 7.52	0.174
Moderately high	1 (10.0)	9 (90.0)	9.56	1.19 - 76.55	0.033	15.15	1.78-128.68	0.013
Severely high	0 (0.0)	18 (100.0)	-	-	-	-	-	-
Gravidity								
1-4	132 (46.2)	154 (53.8)	1					
5-9	10 (50.0)	10 (50.0)	0.86	0.35 - 2.12	0.739			
Parity								
0-4	133 (46.3)	154 (53.7)	1					
5-9	9 (47.4)	10 (52.6)	0.96	0.38 - 2.43	0.931			
HIV status*								
Negative	116 (46.4)	134 (53.6)	1					
Positive	24 (47.1)	27 (52.9)	0.97	0.53 - 1.78	0.931			

OR=Odds Ratio, aOR=adjusted Odds Ratio, CI=Confidence Interval, P=P-value, * - 5 unknown HIV status.

4. Discussion

We found that obesity in pregnant women was a risk factor associated with adverse pregnancy outcomes among women who delivered at IHO. The prevalence and impact of overweight and obesity in an Australian obstetric population found that the prevalence of maternal overweight and obesity was (43%), which is higher than that reported in another study of Australian women giving birth in Queensland between 1998 and 2002, which reported that 34% of women were overweight or obese (Callaway, et al. (2006). Studies from South Africa and Sudan showed overweight and obesity to be associated with increased likelihood of caesarean section, gestational diabetic mellitus (GDM), and macrosomia in pregnant women with obesity (Basu&Jeketera, 2010). A study in China found an association between maternal weight and hypertensive disorders of pregnancy and GDM (Chen, et al. 2010).

We found that mothers with lower levels of haemoglobin (<10 gm%) were almost four times more likely to have an adverse pregnancy. The low haemoglobin in pregnancy increases the risk of maternal and perinatal morbidity and mortality, and is associated with premature labor and low birth weight (Haider, et al.2013). According to the last two Uganda Demographic and Health Surveys, there was a decline in the prevalence of low haemoglobin in pregnancy in Uganda from 41.2% to 30.5% between 2001 and 2011 respectively (Uganda Bureau of Statistics II, 2012). We found that mothers having moderately high blood pressure. This could be due to poor socio-demographic characteristics e.g. unemployment, unmarried and lower educational status. Moderate high BP require antihypertensive treatment and there seems to be less risk of developing severe hypertension, but no difference in outcomes of preeclampsia, neonatal death, preterm birth, and small for gestational age babies with treatment (Abalos, et al. 2007). We also found that mothers having shorter gestational period [32-37 weeks] were almost five times more likely to suffer an adverse pregnancy outcome compared to longer gestational period [38 -42 weeks].

We found that pregnant women from rural areas were twice more likely to develop adverse pregnancy outcomes compared to women from urban areas. This could be due to poor access to information about pregnancy and its effects in rural areas whereas the information is readily available in urban areas in the form of internet, library, television and an adolescent friendly clinic. Therefore mothers from urban areas are likely to avoid an issue that predisposes them to adverse pregnancy outcomes.

We found that all maternal deaths occurred among mothers aged 20-45 years. This could be due to ignorance to seek medical care on time. Advanced maternal age (≥35 years) is associated with increased stillbirths, preterm births, intrauterine growth restriction, and chromosomal abnormalities (Carolan, 2011 &Ngowaet et, al. 2013). In some settings, older mothers have lower socioeconomic status, less schooling, and higher parity, whereas in others there are educated women who delay pregnancy for career reasons and are at increased risk of obesity, diabetes, hypertension, and associated pregnancy complications (Kenny et al.2013).

5. Limitations

We could not find the parents or guardians of some of the teenage mothers (minors) to give informed consent and we therefore excluded them from the study. Some patients' documents were also incomplete and unclear.

6. Conclusions

Living in a rural area, shorter gestational period, haemoglobin level < 10gm%, obesity, and having moderately high blood pressure were found to be significant risk factors for adverse pregnancy outcomes. All the maternal deaths were in the 20-45 years old pregnant mothers. We recommend educating women on these risk factors in order to reduce the burden of adverse pregnancy outcomes.

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