Assessment and Comparison of Obstetric Characteristics and Perinatal Outcomes of Rural Population of South Africa

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Abstract
Context: Maternal and perinatal morbidity and mortality are the major health problems confronting many developing countries including South Africa. In developing countries, interventions that are known to be effective in lowering maternal and perinatal mortality and morbidity are not universally provided. In the past, access to maternal health services was a major problem for rural and black communities of SA.
Objective: The objectives were to assess and compare the demographic and obstetric characteristics and perinatal outcome indicators over time.
Study design, Setting and Subjects: A retrospective comparative study was conducted for women delivered during 1999 (3875) and 2004 (3912) at a rural Empangeni hospital. Multivariate logistic regression was undertaken to determine the significant predictors for outcome variables.
Results: The prevalence of teenage pregnancy and pregnancy of younger women (<25 years) were increased significantly by 3% and 8% respectively ($p < 0.05$). There was a significant reduction of pregnancies among higher parity (parity 5 or more) women during 2004 ($p < 0.05$). There were significant reductions of eclampsia, anaemia, and post partum haemorrhage during delivery for the year 2004. Breech presentation was 3.75 times more likely to deliver preterm and 5.45 times more likely to deliver low birth weight babies. Pregnancy induced hypertension was more likely to have preterm (OR = 3.50) and low birth weight babies (OR = 2.09). Eclampsia was also a risk factor for preterm (OR = 6.14), and low birth weight babies (OR = 18.42).
Conclusion: Further research is needed to find the causes of higher rate of teenage pregnancies and simple strategies to combat high rates of negative perinatal outcomes.
Key Words: Pregnancy Complications, Outcome, Rural Healthcare

Introduction

One of the Millennium Development Goals of South Africa's (SA) health system is to reduce maternal and child mortality by improving health care.[1] If priorities and effective interventions are to be designed to improve health, the identification of risk groups and conditions must be identified. The maternal mortality ratio for SA is estimated 147 per 100 000 live births and it is higher (154) for KwaZulu-Natal province (KZN) for the year 2004. The perinatal mortality rates for KZN and SA are 37.5 and 26.5 per 1000 live births respectively for the year 2006. [2, 3] Demographic such as age and parity; existing medical conditions; pregnancy and obstetric complications are some of the known risk factors for negative pregnancy outcome .[4]

Adolescent/teenage girls (age less than 18 years), are often associated with adverse obstetric and pregnancy outcomes such as obstructed labour, low-birth-weight deliveries, still births, neonatal deaths, eclampsia, depression, anxiety, preterm births, low-birth-deliveries, fetal growth retardation and perinatal mortality.[5, 6, 7] Even their children are considered to be prone to complications after delivery [8] Mother's age at first pregnancy of 35 years or over is also considered high risk pregnancy.[9] The pregnancy complications are also related to

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Table 1: Comparison of pregnancy rates according to age and parity of the sample population of Empangeni hospital for the year 1999 and 2004.

Variables	**Year 1999**		
(n = 3875)			
i	**Year 2004**		
(n = 3912)			
ii	**p value**		
i / ii			
Mean Age	24.61		
(SD = 6.459)	24.62		
(SD = 6.153)	NS		
Teenage (< 19 yrs)	14.26	17.37	p < 0.05
19 24 yrs	35.41	40.52	p < 0.05
25 29 yrs	20.72	21.24	NS
30 34 yrs	12.18	12.70	NS
35 39 yrs	6.01	6.37	NS
40 yrs and above	2.50	1.87	NS
Parity			
Parity nil	45	44.81	NS
Parity 1 4	49.65	50.93	NS
Parity 5 or more	5.35	4.26	p < 0.05

parity for example, pregnancies in grandmultiparous women (who gave birth five or more previous babies) have been considered risky. [10, 11] Intrapartam complications such as fetal malpresentation, placental abruption, dysfunctional uterine contractions and postpartum hemorrhage are commonly linked to grandmultiparity.[12, 13]

Maternal and child health programme in SA is located in general development policies. These policies are focused on meeting the basic needs of the people. To comply with these principles, free healthcare services for pregnant mothers and children under the age of 6 years in public health facilities are introduced since 1994. Standard protocol and guidelines on antenatal and care during delivery have been developed nationally and implemented throughout the country in 2002 to improve maternal and child health.[9] "Saving mothers" and "saving babies" reports publish every year by the SA National Department of Health and Medical Research Council and report on national and provincial maternal and perinatal health indicators including pregnancy outcomes. There are few studies from SA and particularly from rural KZN that report and compare demographic profile of pregnant population, pregnancy complications and outcomes over time. This study thus concerns with the objectives of assessing and comparing demographic and obstetric characteristics and perinatal outcome indicators for two periods (5 years apart) 1999 and 2004

Table 2: Comparison of Obstetric Complications (Characteristics) of the Samples During the Years 1999 and 2004.

Variables			
Complications	**Year 1999**		
(n = 3875)			
Rates	**Year 2004**		
(n = 3912)			
Rates	**p value**		
i / ii			
Ante partum hemorrhage	0.8	0.6	NS
PIH	8.2	7.2	NS
Eclampsia	1.3	0.8	p < 0.05
Gestational diabetes	0.2	0.1	NS
Anaemia	7.5	5.8	p < 0.05
Multiple pregnancy	2.2	2.0	NS
Preterm delivery rate	11.69	12.53	NS
Term delivery	85.70	85.12	NS
Post Term delivery	1.47	2.17	p < 0.05
Labour Induced	5.1	3.4	p < 0.05
Labour Augmented	1.7	1.9	NS
Third degree perineal tear	0.3	0.4	NS
Retained Placenta	0.3	0.2	NS
Post-partum hemorrhage	1.5	0.9	p < 0.05
Mode of Delivery			
Vaginal Normal	73.2	71.2	NS
Vaginal Assisted			
Vacuum	2.2	3.7	p < 0.05
Forceps	0.3	0.5	NS
Cesarean deliveries	25.3	24.6	NS
Emergency caesarean deliveries		18.2	16 NS

from a rural hospital for taking appropriate strategies for interventions.

Materials and Methods

Setting and Population

Empangeni hospital is situated in the Uthungulu health district (one of the 11 districts) of KZN and covers the residence of over 450 000 people who are mainly rural, black and who speak isiZulu. It is a 256 bedded maternity and neo-natal care hospital and provides obstetric, gynaecological and neonatal services. It acts as a referral centre

Table 3: Comparison of Perinatal Outcomes (Rates) of the Sample Women Who Delivered during 1999 and 2004 at Empangeni Hospital.

Variables	**Year 1999 (n = 3875) i**	**Year 2004 (n = 3912) ii**	**p value i / ii**
Low-birth-weight delivery rates (< 2500 gm)	13.2	14.4	NS
Birth outcomes			
Live birth	96.7	96.8	NS
Still Birth	3.3	3.1	NS
FSB	1.4	1.1	NS
MSB	1.9	2	NS
Mean Apgar Score			
In 1 min	7.98	8.07	NS
In 5 min	9.40	9.47	NS

for 14 rural clinics. It covers approximately 95% deliveries of the public institutions of the district. Antenatal care and care during delivery are undertaken in the hospital and clinics based on the national protocol and guidelines.[9]

Study Design, Sample Selection and Data Collection

A retrospective comparative study was conducted targeting all women delivered at Empangeni hospital during the years of 1999 and 2004 (January December). For sample size to be adequate, we selected half of the women delivered at Empangeni hospital (4118 and 4982 from the total of 8236 and 9964 for the year 1999 and 2004 respectively). The samples were randomly selected using computer generated random numbers. Data were collected from the maternity ward delivery register, the only source of official data. The register contained women's demographics (name, age, address of mothers), information on pregnancy complications (e.g. anaemia, pregnancy induced hypertension (PIH) and diabetes, ante-partum hemorrhage, eclampsia), obstetric, labour and perinatal information. Standard definitions of the conditions were used to diagnose the above conditions as stipulated in the national guidelines.[9] For example, prevalence of anaemia in pregnancy was considered as the percentage of women who had haemoglobin level < 10 gm/dL at 36 weeks or later gestation in accordance with the national definition of anaemia in pregnancy.

The attending midwives recorded this information during admission and after delivery. All midwives working at the labour ward were oriented and received in-service training on filling of labour ward register and compilation of monthly summaries for the presentation at weekly perinatal mortality meetings. We excluded those data that did not have one or more of the outcome variables.

Prior permission was obtained from the hospital management and the institutional review committee for utilizing the maternity register to conduct the study.

Data Analysis

Relevant data from the selected women were entered into Microsoft excel 2003 spreadsheet program and imported to SPSS 12.0.1 for analysis. The analysis and reporting of the results follow the STROBE guidelines. The analysis results of patient demographics and baseline outcome variables (both primary and secondary) were summarized using descriptive summary measures: expressed as mean (standard deviation) or median (minimum-maximum) for continuous variables and percent for categorical variables. All statistical tests were performed using two-sided tests at the 0.05 level of significance. For all regression models, the results were expressed as effect (or odds ratios for binary outcomes), corresponding two-sided 95% confidence intervals and associated p-values. *P-values were reported to as p < 0.05 if statistically significant and NS if not significant.*

Results

The mean ages of pregnant women between the periods were similar (24.61 yrs) (Table 1). The proportions of teenage mothers were significantly higher during 2004 (17%) compared to 1999 (14%). A significantly higher rate of pregnancy among mothers less than 25 years age (58% in 2004 compared to 50% in 1999) was observed. There was a significant reduction of pregnancies among higher parity (parity 5 or more) women during 2004.

Comparison of pregnancy and obstetric outcomes are shown in Table 2. The rates had significantly higher during 2004 compared to the rates of 1999 were; post term and vacuum deliveries. The rates found significantly lower during 2004 were; incidence of eclampsia, the prevalence of anaemia at 36 weeks or later gestational age, induction of labor and PPH. No significant differences were observed for the rates of APH, PIH, gestational diabetes, multiple pregnancy, preterm delivery, caesarean (inclusive of emergency) section delivery, augmentation of labor, third degree perineal tear and retained placenta. Table 3 showed the perinatal outcomes between the two study periods. The different perinatal outcome indicators were similar for the two periods.

Multiple logistic regression outputs (Table 4) showed that breech presentation was a significant predictor for preterm and LBW deliveries. Mothers with previous caesarean deliveries were found twice (OR = 2.26) more likely to deliver FSB. Induction of labor was instituted more for preterm pregnancies (OR = 2.46) and thus resulted in more low birth weight babies (OR = 2.24) and FSB (OR = 4.38). PIH among pregnant mothers was more likely to have preterm delivery (OR = 3.50) and LBW babies/deliveries (OR = 2.09). Eclampsia during pregnancy was a major risk factor for preterm (OR = 6.14), and LBW (OR = 18.42) deliveries as well as forceps deliveries were more likely (OR = 5.79) used to deliver FSB babies.

Discussion

The aim of this study was to test the hypothesis that the demographic profile, the pregnancy complications (characteristics) and outcomes of the pregnant women had changed over time. This hypothesis was proved partially, as there is a significant increase of teenage pregnancy, pregnancy of earlier age group (e.g. < 25 years) and significant reduction of pregnancy among grandmultiparous women. Significantly lower rates of obstetric complications were observed e. g., eclampsia, anaemia and PPH during 2004. The perinatal outcomes during the periods (1999 and 2004) remained at the same level.

This study was limited to those women who delivered at Empangeni hospital. Since most of the deliveries of the public health facilities in Uthungulu district were conducted at Empangeni hospital, data reflected or represented the overall delivery information for Uthungulu district. Mothers who delivered at home or in private health facilities during the study period were not included. We considered this as a limitation of the study, although a vast majority (more than 95%) of rural black pregnant women were known to attend public health facilities for antenatal care in rural areas of KZN and a higher proportion (89%) deliver at health facilities in SA.[14, 15] Since maternity care is free in public health facilities thus we expected a higher utilization rate for deliveries in this area. The review of records retrospectively limited

availability of study variables and thus led to information bias. Furthermore, incomplete and incorrect recording of observations may lead to information bias. But the midwives were trained and oriented with the labour ward register, thus, it was assumed that such bias would be limited.

It was observed that there was a significant increase of teenage pregnancy over time and is higher than the KZN provincial rate.[3] Pregnancy in the earlier age group e.g. < 25 years were significantly higher in this population. The factors that might have contributed to the increase of pregnancy in rural black younger women could be the change in sexual behavior e. g., early initiation of sex, non-use of family planning methods by the younger women and or encouraged to fall pregnant to qualify for social grant (child support grant).[16, 17, 18, 19] An antenatal care audit conducted at the same hospital during 2004 found that 90% of those pregnant women had no income and were poor.[20] Strategies are thus urgently needed to improve the socio-economic conditions of rural people, particularly women of earlier age who are found to be pregnant while they should be in schools. The significant reduction of pregnancy rate among higher parity (5 or over) women e. g, 5.35% in 1999 to 4.26% in 2004 could have been due to the successful adaptation of effective family planning methods by the higher parous and older women and rapidly growing urbanization in South Africa.[21]

Although there was not much change in obstetric complications and perinatal outcomes over the

Table 4: Logistic Regression Output for Outcome Variables (Preterm, LBW and FSB Deliveries).

Independent variables	Dependant variables					
	Preterm		LBW		FSB	
	Sig	OR (95% CI for OR)	Sig	OR (95% CI for OR)	Sig	OR (95% CI for OR)
Age	.00	.96 (.95; .98)	.16	.98 (.97; 1.01)	.01	1.03 (1.01; 1.07)
Breech presentation	.00	3.75 (2.59; 5.44)	.00	5.45 (3.5; 8.48)	.12	1.65 (.86; 3.15)
Previous C/S	.53	1.10 (.8; 1.52)	.49	.87 (.60; 1.27)	.00	2.26 (1.25; 4.09)
Induction of labour	.00	2.46 (1.8; 3.3)	.00	2.24 (1.56; 3.21)	.00	4.38 (2.75; 6.97)
Augmentation of labour	.48	1.20 (.7; 2.0)	.56	1.17 (.67; 2.05)	.00	4.34 (2.18; 8.66)
PIH	.00	3.50 (2.83; 4.35)	.00	2.09 (1.62; 2.71)	.05	1.50 (.99; 2.26)
Eclampsia	.00	6.14 (3.7; 10.09)	.00	3.40 (1.83; 6.28)	.67	1.23 (.45; 3.39)
Caesarean delivery	.80	1.02 (.85; 1.2)	.00	1.36 (1.10; 1.67)	.00	.26 (.17; .42)
Vacuum	.00	.39 (.22; .71)	.00	.34 (.16; .72)	.65	1.22 (.50; 2.96)
Forceps Delivery	.30	.50 (.13; 1.86)	.43	.54 (.12; 2.46)	.01	5.79 (1.48; 22.6)
Sex of the baby	.27	1.08 (.93; 1.26)	.00	1.27 (1.08; 1.5)	.03	.72 (.53; .97)
Constant	.07	.490	.00	13.62	.49	1.68

period, significantly lower rates of eclampsia (0.9%), anaemia (5.8%) and PPH were observed during 2004. In developing countries, the prevalence's of eclampsia were known to vary widely, between 0.5% and 8%.[22] It used to be a common problem in developing countries because of a low literacy level, lack of health awareness and education, poverty, superstitious beliefs and practices that prevent women from seeking medical advice and care during pregnancy.[21] These factors may prevail among the rural population of KZN. An encouraging finding from an antenatal care audit confirmed that virtually all pregnant women attended antenatal care and most (88%) received antenatal care from PHC facilities with an average of 6 antenatal visits before delivery. Over 95% women received BP, hemoglobin estimation, urine dip sticks tests (for protein, sugar and blood) while their height and weight was checked on every visit as recommended by the national guidelines.[9, 20] Thus it could be assumed that the optimal management of essential hypertension and PIH were the probable reasons for the prevention of eclampsia during antenatal period.

A higher rate of anaemia in early pregnancy (at the booking visit) was reported from Uthungulu in an earlier study.[20] To reduce anaemia in pregnancy, prophylaxis with haematinics were given to all pregnant women and intermittent screening of anaemia were conducted (e. g., at the booking visit, visits schedule at 28 and 36 weeks of gestations) as a routine standard practice.[9] Thus this lower rate of anaemia at term was expected. The overall caesarean section delivery rates (24%) were higher for both periods and were higher than the rates observed in SA demographic health survey (SADHS) 2003 (21%).[3, 15] This could be due to the deliveries in health facilities that excluded deliveries at home and SADHS includes all deliveries in the communities.

Preterm delivery rates were similar during the comparison period but at a higher rate of over 11%. Preterm delivery is considered the most important cause of perinatal mortality.[23] No obvious causes of preterm delivery had yet been established, but several etiological risk factors had been identified such as poor socioeconomic status, maternal malnutrition, illiteracy, maternal age below 20 years and over 35 years, cigarette smoking, and trauma.[14, 24] A number of other medical conditions have also been found associated with preterm birth and these include; diabetes mellitus, urinary and genital tract infections, HIV infection and psychological stress. Some of these factors are prevalent in this population such as poverty and high rate of HIV infection.[25]

Low birth weight delivery rates though remained at the same level but the rates for both years were higher (> 13%) than the rate observed in SADHS 2003.[15] One of the limitations of SADHS survey was that over 30% of the sample did not report birth weigh of their babies. Our findings were lower than other African countries (e.g., 18% in Tanzania during 1999, 19% in Kenya during 2004) but higher than Brazil (9%), a country with similar economy to SA.[26, 27] One of the most known factors for low-birth-weight delivery could be the increasing prevalence of HIV infection among pregnant women in KZN (20% in 1996 and 39.5% in 2006).[25]

The prevalence of teenage pregnancy and pregnancy of earlier ages (<25 years) were increased. Most of the pregnancy complications decreased over 5 year's period and there were no change in perinatal outcomes. Further research is needed to find the causes and simple strategies to combat of higher rate of teenage pregnancies and negative perinatal outcomes.

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