Placenta previa and pre-eclampsia: analyses of 1645 cases at Medani Maternity Hospital, Sudan

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INTRODUCTION

Pre-eclampsia, one of the most common complications of pregnancy, affects approximately 10% of births (Robillard et al., 2003). It is a leading cause of maternal and perinatal mortality worldwide (Duley, 2009). Although, the exact etiology of pre-eclampsia is not yet known, many risk factors have been demonstrated such as low education, primiparity, family history of hypertension, obesity, younger and advanced maternal age, and ethnicity (Conde-Agudelo and Belizán, 2000; Lee et al., 2000; Roberts et al., 2003; Sibai et al., 2005; Adeyinka et al., 2010). Therefore, if women at risk of pre-eclampsia are identified on the basis of epidemiological and clinical risk factors, the awareness can be raised, this will facilitate to make earlier diagnoses and predict which patients are more likely to develop pre-eclampsia and can help to monitor patients as well.

Most of the research on pre-eclampsia was conducted at settings with good resources; few published data exist in low resources settings (Conde-Agudelo and Belizán, 2000). Recently, it has been shown that placenta previa is associated with low frequencies of pre-eclampsia and low maternal blood pressure (Kiondo et al., 2012). However, there are few published studies – with inconsistent findings – on the association between placenta previa and pre-eclampsia. While some studies reported the protective effects, other studies did show any associations, slightly increase in the incidence and significantly elevated incidence pre-eclampsia in placenta previa (Little and Friedman, 1964; Brenner et al., 1978; Newton et al., 1984; Ananth et al., 1997; Hasegawa et al., 2011).

There is an extremely high maternal mortality in Sudan with pre-eclampsia/eclampsia accounting for 4.2% of the obstetric complications and 18.1% of maternal deaths (Leiberman et al., 1991; Ali and Adam, 2011; Ali et al., 2012). The current study was conducted at Medani Maternity Hospital in Central Sudan to investigate the potential risk factors for pre-eclampsia including placenta previa. The data obtained is very useful for the health planners, health providers, and augments the previous research planners, health providers, and augments the previous research

MATERIALS AND METHODS

A retrospective case-control study was conducted at labor ward at Medani Maternity Hospital, Central Sudan. Medani Maternity Hospital is a tertiary care hospital for women who receive prenatal care at the hospital as well as for referrals from the other clinics and hospitals. All women with risk factors or obstetric/medical complications are referred to the hospital. However, the referral criteria are not strictly adhered to and many women without any significant complications are allowed to deliver at the hospital. Medical files were reviewed for the patients during the period January 2003 through December 2010. A case was defined as a woman who had given birth and who was diagnosed as being pre-eclamptic. Pre-eclampsia is defined as pregnancy-induced hypertension associated with proteinuria. Pregnancy-induced hypertension is defined as new hypertension with blood pressure of 140 mm Hg systolic or diastolic blood pressure of 90 mm Hg diastolic or greater arising after 20 weeks of gestation in a woman who is normotensive before...
20 weeks gestation. Proteinuria is defined as excretion of 300 mg or more of protein in 24 h urine sample or ≥2+ on dipstick. A consecutive control was taken for each case. Controls were par- turi ent women admitted for delivery, without any blood pressure values greater than 139/89 mm Hg or proteinuria recorded in the pregnant health card during the antenatal visits and at the time of delivery. Pregnant women with twins or diabetes were excluded, because these were known predictors for pre-eclampsia (Adeyinka et al., 2010). Placenta previa was diagnosed by ultrasound, confirmed during the cesarean delivery, and documented as such in the medical file.

Data were entered in computer using SPSS for windows version 16.0. Means and proportions were compared by Students’ t-test, X², and Fisher’s exact tests as appropriate. Univariate and multivariate analyses were performed where pre-eclampsia was a dependent variable and maternal characteristics, age (<20, 20–35, and >35 years), parity (primiparous, 2–5 and para >5), educational levels (illiterate, secondary level ≥ university), and prenatal care (none, once and twice, and >twice), anemia (Hemoglobin <11 gm/dl), and placenta previa as possible influencing factors. Odds ratio and 95% confidence interval were calculated. P < 0.05 was regarded as significant.

ETHICS
This was a retrospective study in which the data in the files of the patients were analyzed anonymously and no fresh personal data were required. The study was approved by the local ethical board of the institution.

RESULTS
During the study period there were 54,339 singleton deliveries among which 1765 women were diagnosed as pre-eclampsia, with the incidence of 3.2%. Out of these women, 1645 had complete data concerning age, parity, education level, prenatal care, placenta previa, and hemoglobin levels and they were included in the final analyses. The excluded 120 women had no placenta previa (excluded by ultrasound) but were not included in the final analyses because of other missing data sets (educational level etc.).

Compared with the controls, significantly higher numbers of pre-eclamptic women had less level of education, prenatal care attendance, and had anemia, Table 1. The mean (SD) age of the pre-eclamptic women was significantly higher than in the controls, 29.0 (6.3) vs. 28.4(6.0) years, P = 0.003. There was no case of severe anemia (hemoglobin <7 gm/dl).

The prevalence of placenta previa was 0 (0%) and 55 (3.3%), P < 0.001 in pre-eclamptic and control women, respectively (Table 1).

In logistic regression, the risk factor for pre-eclampsia increased with age, i.e., in comparison to the women with age ranged 20–34 years, younger women (<20years) were less likely to have pre-eclampsia (OR=0.2, 95% CI: 0.1– 0.3; P < 0.001), women with age >35 years were at higher risk for pre-eclampsia (OR = 1.4, 95% CI: 1.1–1.8; P = 0.004; Table 2).

The other risk factors for pre-eclampsia were primiparity (OR=3.3, 95% CI: 2.7–4.0; P < 0.001) and para >5 (OR=3.1, 95% CI: 2.4–4.0; P < 0.001) and anemia (OR=3.3, 95% CI: 2.8–3.9 P < 0.001). The risk of pre-eclampsia was inversely increased with education level and prenatal care attendance.

Placenta previa was a significant protective factor of pre- eclampsia (OR = 0.3, 95% CI: 0.1–0.7; P = 0.006; Table 2).

### Table 1 | Comparing age, parity, educational levels, prenatal care, anemia, and placenta previa between the cases and controls.

| The variable                  | Pre-eclamptic women (n = 1645) | Controls (n = 1645) | P    |
|-------------------------------|-------------------------------|---------------------|------|
| Age groups in years           |                               |                     |      |
| <20                           | 65 (4)                        | 121 (7.4)           | <0.001|
| 20–35                         | 1294 (78.7)                   | 1304 (79.3)         | 0.7  |
| >35                           | 286 (17.4)                    | 220 (13.4)          | 0.001|
| Parity groups                 |                               |                     |      |
| Primiparous                   | 585 (35.6)                    | 294 (18.0)          | <0.001|
| 2–5                           | 724 (44.0)                    | 1217 (74)           | <0.001|
| >5                            | 336 (20.4)                    | 134 (8.0)           | <0.001|
| Educational level             |                               |                     |      |
| Illiterate                    | 451 (27.4)                    | 423 (25.7)          | 0.2  |
| Secondary                     | 1116 (67.8)                   | 1087 (66.1)         | 0.2  |
| >Secondary                    | 78 (4.7)                      | 135 (8.2)           | <0.001|
| Prenatal care visit           |                               |                     |      |
| None                          | 409 (24.9)                    | 235 (14.3)          | <0.001|
| One and two                   | 967 (58.8)                    | 835 (50.8)          | <0.001|
| >Two                          | 269 (16.3)                    | 575 (35.0)          | <0.001|
| Anemia                        | 1287 (78.2)                   | 738 (44.9)          | <0.001|
| Placenta previa               | 0 (0.0)                       | 55 (3.3)            | <0.001|

### Table 2 | Risk factors for pre-eclampsia in Medani Hospital using univariate and multivariate analyses.

| The variable                  | Univariate analysis | Multivariate analysis |
|-------------------------------|---------------------|-----------------------|
| Age groups in years           | OR 95% CI P         | OR 95% CI P           |
| <20                           | 0.4 0.3–0.7 <0.001 | 0.2 0.1–0.3 <0.001    |
| 20–35                         | 1.3 1.0–1.5 0.006 | 1.4 1.1–1.8 0.004     |
| Parity groups                 |                     |                       |
| Primiparous                   | 3.3 2.8–3.9 <0.001 | 3.3 2.7–4.0 <0.001    |
| 2–5                           | 4.2 3.3–5.2 <0.001 | 3.1 2.4–4.0 <0.001    |
| >5                            |                     |                       |
| Educational level             |                     |                       |
| Illiterate                    | 1.8 1.3–2.5 <0.001 | 2.6 2.0–3.5 <0.001    |
| Secondary                     | 1.7 1.3–2.3 <0.001 | 1.4 1.1–1.8 0.004     |
| >Secondary                    |                     |                       |
| Prenatal care visit           |                     |                       |
| None                          | 3.7 3.0–4.6 <0.001 | 4.2 2.9–6.0 <0.001    |
| Once and twice                | 2.4 2.0–2.9 <0.001 | 1.7 1.3–2.1 <0.001    |
| >Twice                        |                     |                       |
| Anemia                        | 4.4 3.8–5.1 <0.001 | 3.3 2.8–3.9 <0.001    |
| Placenta previa               | 0.1 0.07–0.3 <0.001 | 0.3 0.1–0.7 0.006     |
REFERENCES
Adam, I., Elbassan, E. M., Mohmmed, A. A., Sahil, M. M., and Elbashir, M. I. (2011). Malaria and pre-eclampsia in an area with unstable malaria transmission in Central Sudan. Malar. J. 10, 258.
Adeyinka, D. A., Oladimeji, O., Adekambi, T. I., Adeyinka, F. E., Falope, Y., and Aimaiku, C. (2010). Outcome of adolescent pregnancies in southwestern Nigeria: a case-control study. J. Matern. Fetal. Neonatal. Med. 23, 785–789.
Ali, A. A., and Adam, I. (2011). Lack of antenatal care, education, and high maternal mortality in Kasala hospital, eastern Sudan during 2005–2009. J. Matern. Fetal. Neonatal. Med. 24, 1077–1078.
Ali, A. A., Okud, A., Khajuli, A., and Adam, I. (2012). High incidence of obstetric complications in Kasala hospital, eastern Sudan. J. Obstet. Gynaecol. Sudan. 32, 148–149.
Ali, A. A., Rayis, D. A., Abdallah, T. M., Elbashir, M. I., and Adam, I. (2011). Severe anaemia is associated with a higher risk for pre-eclampsia and poor perinatal outcomes in Kasala hospital, eastern Sudan. BMC Res. Notes 4:311. doi:10.1186/1756-0500-4-311
Ananth, C. V., Bowes, W. A. Jr., Savitz, D. A., and Luther, E. R. (1997). Relationship between pregnancy-induced hypertension and placenta previa: a population-based study. Am. J. Obstet. Gynecol. 177, 997–1002.
Bakheit, K. H., Bayoumi, N. K., Eltom, A. M., Elbashir, M. I., and Adam, I. (2009). Cytokines profiles in Sudanese women with pre-eclampsia. Hypertens Pregnancy 28, 224–229.
Bakheit, K. H., Ghebremeskel, K., Pol, K., Elbashir, M. L., and Adam, I. (2010a). Erythrocyte omega-3 and omega-6 fatty acids profile in Sudanese women with pre-eclampsia. J. Obstet. Gynaecol. Sudan. 30, 151–154.
Bakheit, K. H., Ghebremeskel, K., Zaiger, G., Elbashir, M. I., and Adam, I. (2010b). Erythrocyte antioxidant enzymes and plasma antioxidant vitamins in pregnant women with pre-eclampsia. J. Obstet. Gynaecol. Sudan. 30, 147–150.
Brenner, W. E., Edelman, D. A., and Hendricks, C. H. (1978). Characteristics of patients with placenta previa and results of “expectant management.” Am. J. Obstet. Gynecol. 132, 180–191.
Brosens, I. A. (1977). Morphological changes in the utero-placental bed in pregnancy hypertension. Clin. Obstet. Gynaecol. 4, 573–593.
Conde-Agudelo, A., and Belizán, J. M. (2000). Risk factors for pre-eclampsia in a large cohort of Latin American and Caribbean women. BJOG 107, 75–83.
Duley, L. (2009). The global impact of pre-eclampsia and eclampsia. Semin. Perinatol. 33, 30–37.
Elbassan, E. M., Mirghani, O. A., and Adam, I. (2009). High maternal mortality and stillbirth in the Wad Medani Hospital, Central Sudan, 2003–2007. Trop. Doct. 39, 228–239.
Hasegawa, I., Sekizawa, A., Farina, A., Nakamura, M., Matsuoka, R., Ichizuka, K., et al. (2011). Location of the placenta or the umbilical cord insertion site in the lower uterine segment is associated with low maternal blood pressure. BJOG 118, 1464–1469.
Kashanian, M., Baradaran, H. R., Bahasadri, S., and Alimohammadi, R. (2011). Risk factors for pre-eclampsia: a study in Tehran, Iran. Arch. Iran. Med. 14, 412–415.
Kiondo, P., Wamuyu-Maina, G., Bimenya, G. S., Tumwesigye, N. M., Wandabwa, J., and Okong, P. (2012). Risk factors for pre-eclampsia in Mulago Hospital, Kampala, Uganda. Trop. Med. Int. Health 17, 480–487.
Lee, C. J., Hsieh, T. T., Chiu, T. H., Chen, K. C., Lo, L. M., and Hung, T. H. (2000). Risk factors for pre-eclampsia in an Asian population. Int. J. Gynaecol. Obstet. 70, 327–333.
Leiberman, J. R., Fraser, D., Kasis, A., and Mazor, M. (1991). Reduced frequency of hypertensive disorders in placenta previa Obstet. Gynecol. 77, 83–86.

Little, W. A., and Friedman, E. A. (1964). Significance of the placental position. A report from the collaborative study of cerebral palsy. Obstet. Gynecol. 23, 804–809.

Newton, E. R., Barss, V., and Cetrulo, C. L. (1984). The epidemiology and clinical history of asymptomatic mid trimester placenta previa. Am. J. Obstet. Gynecol. 148, 743–748.

Roberts, J. M., Pearsons, G., Cutler, J., and Lindheimer, M. (2003). Summary of the NHLBI Working Group on research on hypertension during pregnancy. Hypertension 41, 437–445.

Robillard, P. Y., Hulsey, T. C., Dekker, G. A., and Chaouat, G. (2003). Preeclampsia and human reproduction: an essay of long-term reflection. J. Reprod. Immunol. 59, 93–100.

Sibai, B., Dekker, G., and Kupferminc, M. (2005). Pre-eclampsia. Lancet 365, 785–799.

Wang, A., Rana, S., and Karumanchi, S. A. (2009). Preeclampsia: the role of angiogenic factors in its pathogenesis. Physiology (Bethesda) 24, 147–158.

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