Introduction
Ultrasound (US) is an essential tool in managing pregnancy and in modern obstetric practice. However, in low-income countries, the technique is not widely available due to lack of trained health personnel and high cost of equipment. With high pregnancy-associated morbidity in these settings and decreasing cost of US equipment, it may be justifiable to avail US technology to rural midwives. The aim of this pilot study was to investigate the use of US by village midwives in early pregnancy in Damira district, a rural community in North Kordofan state, mid-Western Sudan.

Methods
All 41 midwives in the 20 villages of the Damira district (Bara province, North Kordofan State, Sudan) were invited to participate in the study. Thirty-seven midwives agreed to participate. A two-weeks training was organized for the midwives in Damira Health Center. Basic knobology, scanning techniques, sonographic anatomy and ultrasound appearances in early pregnancy were demonstrated in theoretical and hands-on sessions. A portable, battery-operated US machine was used (Mindray DP-10, Shenzhen, China) with a 3.5 MHz convex abdominal probe. All patients presenting for antenatal care during the period January 7 to February 27, 2018 in 5 primary healthcare centers in the district were referred for US in Damira. Those with amenorrhea 12 weeks or less (n=419) were included in the study. An obstetrician and a radiologist reviewed the cases first. Midwives then scanned the patients and recorded their findings in a structured form. Data was analyzed using a freely available, open-source statistical software package (PSPP, GNU.org).

Results
Of the total study population of 419 patients (mean age 27 years ± 3.6, range 17-41 years) 9 were not pregnant, 13 had missed abortion, 8 threatened abortion, 4 incomplete abortion, 4 had twins, 2 had molar pregnancies and one had ectopic pregnancy. There were 378 patients with viable intrauterine singleton pregnancy. Of the latter group, 297 (78.6%) had their dates confirmed and 81 (21.4%) had dates changed. Midwives recognized normal anatomy (bladder, cervix and uterus) in 100% of patients. The rates of true-positive (sensitivity) for detection of presence of intrauterine gestation sac and fetus, signs of viability (cardiac pulsations), estimation of gestational age (GSD and CRL), location of placenta, missed abortion, incomplete abortion and twin pregnancy were 96.6%, 97.1%, 93.3%, 89.2%, 87.3%, 81.9% and 100% respectively. Sensitivity for the diagnosis of molar pregnancy and ectopic pregnancy was 13.5% and 2.7% respectively.

Conclusion
After a short focused training, village midwives with no previous US experience, could reliably diagnose the presence of pregnancy, viability, twin-pregnancy and missed abortion. They could accurately measure and estimate gestational age in the first trimester as well as determine the location of the placenta. US is useful when used by village midwives for dating the pregnancy and selecting patients to refer for specialist care.