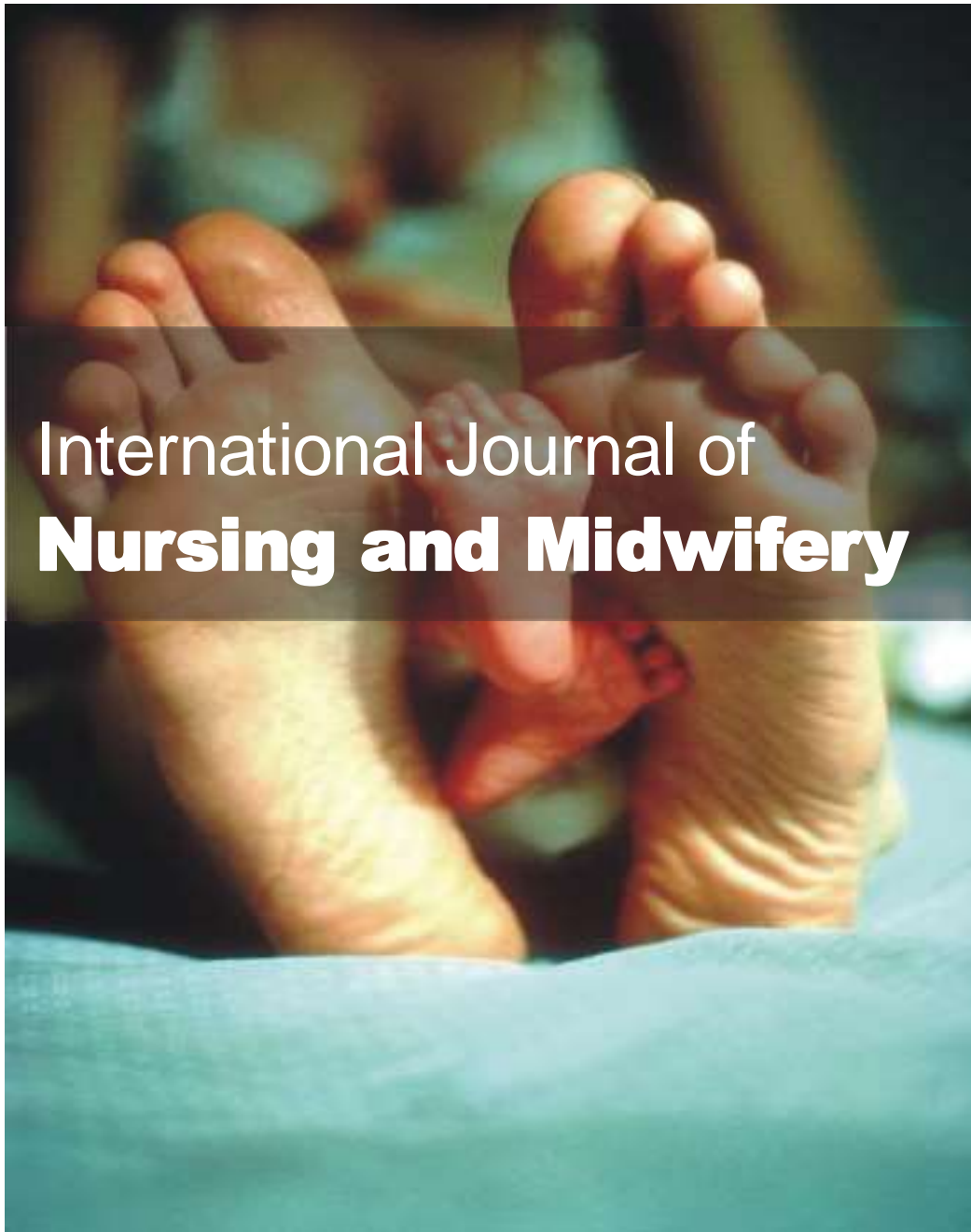


OPEN ACCESS



April 2018
ISSN 2141-2456
DOI: 10.5897/IJNM
www.academicjournals.org



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Full Length Research Paper

Pregnancy outcome and early postnatal weights in diabetic and non-diabetic pregnant rats administered ethanolic extract of *Ocimum gratissimum* leaves during pregnancy

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Received 1 March, 2018; Accepted 29 March, 2018

Extract of *Ocimum gratissimum* (OG), also known as scent leaf, is popularly used to treat diabetes mellitus and its hypoglycaemic activity has been confirmed by *in vivo* studies. The aim was to investigate the effect of this extract on placenta development and birth outcome in diabetic pregnancy. Forty two pregnant rats weighing 150-200 g were used. They were divided into control and extract treated diabetic and non-diabetic groups with 6 rats in each subgroup. Extract treated groups were administered 200 and 400 mg/kg of ethanolic extract of OG orally after the induction of diabetes by administration of alloxan monohydrate after an overnight fast. Treatment commenced in the second trimester and lasted till end of pregnancy. On day 18 of pregnancy, 3 rats from each group were sacrificed and placentae harvested and weighed. On the day of delivery, birth weight and other parameters were recorded. Results show that OG administration caused a significant decrease in placental weights, birth weights, litter sizes and placental-birth weight ratio in both diabetic and non-diabetic pregnancy. In conclusion, the observed decrease in placenta-birth weight ratios may suggest a protective beneficial effect of this extract against macrosomia in diabetic pregnancies and increased risk of cardiovascular disease later in life.

Key words: *Ocimum gratissimum*, gestational diabetes, placenta-birth weight ratio, pregnancy outcome, postnatal growth.

INTRODUCTION

There are evidences that diabetic intrauterine milieu is associated with adverse consequences for fetal and postnatal life. Gestational diabetes occurs when pregnant

women without a previous history of diabetes develop a high blood glucose level (Casanova et al., 2005) which is characterized by an increased placental transport of

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glucose and other nutrients from the mother to the fetus, resulting in fetal macrosomia (kamana et al., 2015). However, in severe maternal diabetes complicated by vasculopathy and nephropathy, intra-uterine growth restriction (Dandrea et al., 2001), and in some cases seizures or stillbirth (Dave and Katyare, 2002) can be seen.

Maternal diabetes is also associated with concentration changes of various hormones, cytokines and metabolites in maternal as well as fetal circulation. Hence, these diabetic-associated changes are likely to affect the placenta, because receptors, transporters and enzymes, which are the primary targets of circulating molecules, are expressed often asymmetrically, on both placental surfaces (Desoye and Hauguel-de-Mouzon, 2007). Altered placental function in gestational diabetes may include changes in invasion, ultimately leading to an enhanced risk of early pregnancy loss, growth restriction and pre-eclampsia, as well as a long-term stimulatory effect on placental growth leading to placentomegaly, which is frequently associated with diabetic pregnancies (Emordi et al., 2016).

Gestational diabetes mellitus (GDM) poses a risk to mother and child. The two main risks GDM imposes on the baby are growth abnormalities and chemical imbalances after birth, which may require admission to a neonatal intensive care unit (kamana et al., 2015). Infants born to mothers with GDM are at risk of being both large-for-gestational-age (kamana et al., 2015) in unmanaged GDM, and small-for-gestational-age and intrauterine growth retardation in managed GDM (Godfrey, 2002). In addition, fetal macrosomia in turn increases the risk of instrumentation deliveries or problem during vaginal delivery (shoulder dystocia) (Haavaldsen et al., 2013). Neonates born from women with consistent high blood sugar levels are also at an increased risk of low blood glucose, jaundice, polycythemia, hypokalemia and hypomagnesemia (Irene et al., 2015). GDM also interferes with maturation, making immature babies prone to respiratory distress syndrome due to incomplete lung maturation and impaired surfactant synthesis (Irene et al., 2015).

Treatment of GDM is somehow problematic as care has to be taken to avoid low blood sugar levels due to excessive insulin injections. More injections can result in better control but requires more effort and there is no consensus as to its benefits (Karen et al., 2000; Jones, 2011; Haavaldsen et al., 2013) With the advent of modern obstetric care, the incidence of congenital malformations and neural tube defects have drastically reduced, but macrosomic babies and associated complications remain high (Kaufmann et al., 2003; Kelly et al., 2005).

Studies have shown that extract of OG has been used to treat diabetes mellitus and its hypoglycemic effect has been confirmed *in vivo* (Lee et al., 2005). Unlike most anti

diabetic drugs, a study revealed that aqueous extract of OG leaf can significantly reduce postprandial hyperglycaemia in type-2 diabetic model rats, without the risk of hypoglycemia (Lumey, 1998). Most studies on its hyperglycemic effect have been carried out in males using animal subjects (Oguabobi et al., 2012; Shittu et al., 2016). Data on its hyperglycemic effect on diabetic pregnancies is scanty. Secondly, there is high rate of consumption of OG by pregnant women (either as spice or herbal drink) in some rural parts of Nigeria, with speculations that it reduces fetal weight thereby making delivery less laborious. This study was therefore undertaken to investigate whether OG, a confirmed anti-diabetic agent, would have any effect on placentomegaly and fetal macrosomia, which are usual complications of diabetic pregnancy.

MATERIALS AND METHODS

Plant preparation and extraction

Freshly matured leaves were purchased from Ekpoma market in Edo State, mid-west Nigeria and the leaves were identified and authenticated by Mr. Chijioke John Onyeukwu of the Department of Plant Science and Biotechnology, University of Nigeria, Nsukka, where a voucher specimen (UNH Number 360b) was deposited. The leaves were air-dried in a dust-free environment and chopped into pieces using an electric blender. Ethanolic extraction of the leaves was carried out using soxhlet extractor as previously described (Metzger et al., 2008). The extract was then concentrated in a water bath and kept at -4°C until use. Phytochemical analysis of the leaf extract was determined using High Performance Liquid Chromatography method as previously described (Metzger et al., 2008).

Experimental animals

Forty-two matured nulliparous female rats weighing between 150-200 g were used for this study. The rats were housed in special clear-sided cages, with a 12:12 h light-dark cycle and were allowed free access to drinking water and standard rat pellet feed. They were allowed to acclimatize for two weeks.

The estrus cycle was monitored for each rat by daily examination of vaginal smears under the light microscope. At pro-estrus, male rats were introduced into the female cages to allow for mating. Mating was proven successful when spermatozoa were observed in the vaginal smear of the female rats the following morning and this was regarded as the first day of pregnancy.

Experimental design

After pregnancy was confirmed, rats were randomly divided into two broad groups; diabetic and non-diabetic groups. Each group had control and graded doses of extract treated sub-groups. Non-diabetic group consisted of control, 200 mg/kg b.w of extract, and 400 mg/Kg b.w of extract subgroups. Diabetic group consisted of control, 200 mg/Kg b.w of extract, 400 mg/Kg b.w of extract, and 0.5 IU/Kg b.w of insulin subgroups. Each of these seven subgroups had a total of eight rats.

Table 1. Phytochemical analysis of *Ocimum gratissimum* (Qualitative).

Test	Result
Ninhydrin	+
Xantheoprotic	+
Tannin	-
Glycoside	++
Terpernoid	++
Steroid	-
Flavonoid	+
Saponin	++
Resin	++
Alkaloid	++
Anthraquinone	-
Phenol	++

+ = slightly present; ++ = moderately present.

Table 2. Quantitative analysis of OG.

Constituent	% Composition
Alkaloids	2.5
Saponin	3.0
Glycoside	0.0155
Flavonoid	0.5205
Phenol	0.1547

Rats were fasted for 12-h before diabetes was induced on day eight of pregnancy using alloxan monohydrate dissolved in normal saline (Myatt, 2006). The injection site was swabbed using iodine solution. While the rat was held in a dorsal position, the amount of alloxan was injected into the caudal vein at the base of the tail using sterile 1ml syringe.

Blood was taken from the tail vein of all rats, and placed on ACCU-CHEK Active test strips, to check for blood glucose level, before induction of diabetes mellitus, using ACCU-CHEK Active glucometer, Roche Germany. This record was taken as the baseline value for blood glucose. The blood glucose level was subsequently checked 24 h after induction. Animals whose blood glucose exceeded 200 mg/dl were considered diabetic (Nahum et al., 1999).

After confirmation of diabetes, rats in the extract treated groups, both diabetic and non-diabetic, were given graded doses of 200 and 400 mg/kg body weight using oral dosing syringe at the second week of gestation. A subgroup of rats in the diabetic group was given 0.5 international units of soluble insulin per kg body weight and was administered using insulin needle intraperitoneally (Oguabobi et al., 2012). The non-treated control groups received feed and water only. The treatment lasted till parturition.

Body weight (using digital electronic weighing scale), and blood glucose levels were monitored daily, after induction, until delivery. This was to assess the severity of the induced diabetic state.

At day 18 of pregnancy, half the number of rats from each group was sacrificed by cervical dislocation according to Institutional Animal Care and Use Committee (IACUC) guideline on euthanasia (Silverman et al., 2014). The placentae and fetuses were harvested for determination of placental and fetal weights and placental-

fetal weight ratio.

On the day of delivery, the litter sizes were noted, birth weight was measured and recorded to the nearest (mg) using an electronic weighing scale, and litters were examined for any anatomical malformations.

Ethical clearance on animal use and handling was obtained from College Of Medicine Research ethics committee, University of Nigeria. A copy of the ethical clearance was attached as an appendix.

Statistical analysis

Results were presented in tables as $M \pm SED$ and compared using student t-test. Level of significance was taken as $p < 0.05$.

RESULTS

Phytochemical analysis of *O. gratissimum* (qualitative) is shown in Table 1. From the qualitative analysis of O.G, it was observed that saponin, alkaloid, phenol, resin, glycoside, terpernoid and carbohydrate, ninhydrin, xantheoprotic, and flavonoid were present in the extract with alkaloids and saponin relatively higher in concentration as observed in the quantitative analysis result (Table 2).

The result from Table 3 shows that the extract of *O.*

Table 3. Effect of consumption of ethanolic extract of *Ocimum gratissimum* on placental weight (g) at day 18 of pregnancy.

Treatment/Groups	Non-diabetic	Diabetic
Control	0.56±0.04	0.65±0.03
200mg/Kg B.W	0.38±0.01*	0.38±0.03*
400mg/Kg B.W	0.28±0.03*	0.31±0.04*
ITDP 0.5 IU/Kg B.W		0.36±0.01*

Values are expressed as mean ± SEM, n= 6. *Significantly different from the control at p < 0.05.

Table 4. Effect of consumption of ethanolic extract of *Ocimum gratissimum* on litter weight at birth.

Treatment/Groups	Non-diabetic	Diabetic
Control	4.44±0.15	5.92±0.27 ^a
200mg/Kg B.W	4.75±0.40	4.24±0.40*
400mg/Kg B.W	4.77±0.20	4.48±0.16*
ITDP 0.5 IU/Kg B.W		5.41±0.36

Values are expressed as mean ± SEM, n= 6. *Significantly different from the control in same group at p < 0.05. ^aSignificantly different between group at p < 0.05.

Table 5. Effect of consumption of ethanolic extract of *Ocimum gratissimum* on litter size at birth.

Treatment/Groups	Non-diabetic	Diabetic
Control	6.67±0.33	7.00±0.58
200mg/Kg B.W	4.33±0.33*	4.33±0.33*
400mg/Kg B.W	4.67±0.88	6.00±1.00 ^a
ITDP 0.5 IU/Kg B.W		5.5±0.50

Values are expressed as mean ± SEM, n= 6. *Significantly different from the control in same group at p < 0.05. ^aSignificantly different between group at p < 0.05.

gratissimum significantly reduced the placental weight in a dose-dependent manner when compared with the control which did not receive the extract. There was no significant difference in the effect of the extract on placental weight between the diabetic and non-diabetic group.

There was no significant reduction in litter weight in the extract treated non-diabetic group compared with the control as shown in Table 4. However, the extract appeared to cause a significant reduction in litter weight in diabetic group when compared with the control and insulin group as shown. In addition, control diabetic group had a significantly higher litter weight when compared to control in non-diabetic group.

The result (Table 5) shows that the 200 mg extract treated group had lesser litter size compared with the control, whereas the 400 mg group was not significantly different from the control and 200 mg group in the non-diabetic group (Table 5). The 200 mg extract treated

group had a significantly number of litter size than the 400 mg, ITDP 0.5 IU/kg/bw and control in the diabetic groups. However, litter size was significantly higher in 400 mg/kg/bw in diabetic group when compared to the non-diabetic group as shown in Table 5.

It was observed that the extract reduced the placental-birth weight ratio when compared with the control as shown in Table 6. In the diabetic group, insulin and extract (400 mg/kg/bw) showed a significant decrease in the placental-birth weight ratio when compared with the control. However, on comparison of non-diabetic and diabetic groups, the diabetic groups had significantly greater placental-birth weight ratio as shown below.

The Figure 1 shows a significant increase in weight of the 200 mg extract treated group when compared with the control throughout the three weeks. The 400 mg extract treated group all died two days postpartum.

From Figure 2, there was a steady increase in the weight of the offspring in both the 400 mg treated group

Table 6. Effect of consumption of ethanolic extract of *Ocimum gratissimum* on placental-birth weight ratio.

Treatment/Groups	Non-diabetic	Diabetic
Control	0.09±0.00	0.15±0.01 ^a
200mg/Kg B.W	0.06±0.00*	0.08±0.01 ^a
400mg/Kg B.W	0.06±0.01*	0.07±0.00*
ITDP 0.5 IU/Kg B.W		0.06±0.01*

Values are expressed as mean ± SEM, n= 6. *Significantly different from the control in same group at p < 0.05. ^aSignificantly different between group at p < 0.05.

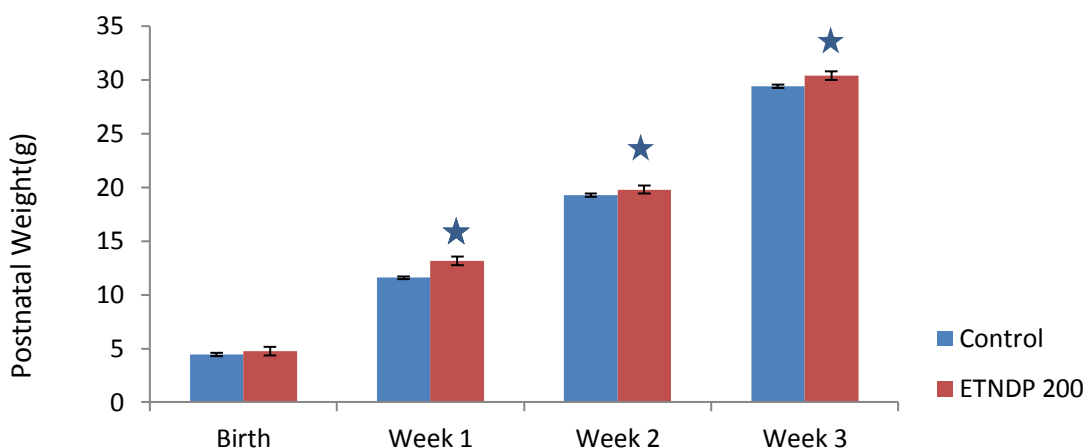


Figure 1. Effect of consumption of ethanolic extract of *Ocimum gratissimum* by non-diabetic pregnant rats on postnatal weight of offspring. ETNDP 200 = extract treated non-diabetic pregnant, 200 mg/Kg b. wt; ETNDP 400: all died two days postpartum. N= P<0.05 compared with control.

and the insulin group. The control group and 200 mg treated group all died before the end of the first week postpartum.

DISCUSSION

The observed decrease in placenta weight in both the diabetic and non-diabetic group in the present study, which appeared to be concentration dependent, may be due to the presence of phenol. Phenol was shown to be an active component of the extract (Tables 1 and 2). Omodamiro et al. (2012) has previously reported the presence of phenol in this extract. Lee et al. (2005) showed that phenol decrease placenta weight by significantly reducing levels of placenta lactogen, prolactin-like protein A and C, and decidual prolactin related protein. Placenta lactogen, which is released by a term placenta, affects glucose and insulin metabolism, by decreasing maternal glucose utilization which helps ensure adequate fetal nutrition (Omodamiro et al., 2012). It also decreases maternal insulin sensitivity leading to an

increase in maternal blood glucose levels (Rich-Edwards et al., 1997). Consequently, decreasing levels of this anabolic hormone will go a long way in reducing placental weight and by extension, fetal weight. Though prolactin-growth hormones were not quantified in this study, however, the result is in line with previous study by Lee et al. (2005) who reported that bisphenol A, an estrogen-like environmental endocrine disrupter, reduced the secretion of the placental prolactin-growth hormone leading to reduced placental and fetal weight and litter size.

There was a significant increase in the resorption sites following extract administration. This suggests that the extract may have interfered with the normal processes of implantation. This observation may be due at least in part to the presence of alkaloid in the extract (Table 2). Alkaloid administered orally in the second trimester has been reported to cause anti-implantation, anti-gonadotropic, anti-progesteronic, selective estrogenic, embryonic resorption and fetotoxic activities without inducing abortions in animals (Yakubu and Musa, 2012). Ting et al. (2014) reported that *Dipsaci Radix* (which is

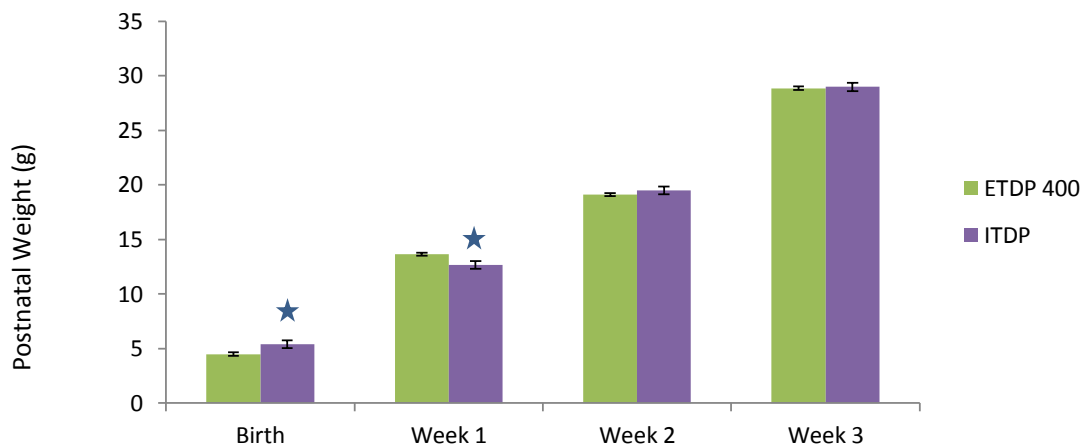


Figure 2. Effect of consumption of ethanolic extract of *Ocimum gratissimum* by diabetic pregnant rats on postnatal weight of offspring. ITDP = Insulin treated diabetic pregnant. ETDP 400 = extract treated diabetic pregnant, 400mg/Kg b. wt; ETDP 200 and Control diabetic: all died within 7 days postpartum; N = P<0.05 compared with control.

high in alkaloid) at a high-dose and long-term administration led to adverse impacts in maternal health and embryo-fetal development in mice and embryonic stem cells. Our results are in support of these previous findings as increased resorption sites may have led to a decrease in the number of viable fetuses that ultimately led to decreased litter size observed in our study.

Adequate placental function is necessary for delivery of nutrients, oxygen, and hormones to the fetus (Setji et al., 2005). The placental-birth weight ratio could be a useful marker for placental efficiency and efficacy (Risnes et al., 2009). Thus, a comparatively large placenta relative to birth weight may be an expression of a relatively inefficient placenta with reduced ability to translate its own growth into fetal growth (Risnes et al., 2009). Studies suggest that a placenta that is large relative to birth weight may be an indicator for reduced nutrient supply to the fetus (Thomas, 2005; Stephanie et al., 2014). In this study, it was observed that extract administration decreased the placental-birth weight ratio possibly in a dose-dependent manner. Both small and large placentae relative to birth weight have been reported to be associated with death in preterm births (Ting et al., 2014). Studies on developmental programming have reported that increased placental-birth weight ratio increases the risk of cardiovascular disease later in life (Van-Assche et al., 1998; Walkinshaw, 2006; WHO, 2014). This observed decrease in the placental-birth weight reported in our study may have been as a result of the extract-induced decrease in the placenta weight reportedly caused by the phenol constituent of the extract.

As shown in Figure 1, it was observed that low dose of OG accelerated early postnatal weight of offspring in

non-diabetic pregnancy while Figure 2 shows that high dose extract had similar effect as insulin on early postnatal weight of the offspring in diabetic rat. During the postnatal phase, the litters feed on the breast milk of their mothers. The accelerated growth observed may be from the composition of the breast milk. Since OG is a galactagogue (Yakubu and Musa, 2012), it may have enhanced breast milk production as well as its composition. OG was observed to be toxic at high dose for non-diabetic offspring as there was 100% neonatal mortality. Though low dose extract was not protective against the complications of diabetic pregnancy as both mother and offspring died during the early postnatal period, high dose extract was however protective against the complications of diabetes in the diabetic group.

Limitation to this study

A major limitation to this study is the failure to ascertain the lethal dose of this extract through acute toxicity test. Further studies are recommended to determine the suitable dose of the extract to eliminate fetal resorption associated with the use of this extract as reported in this study.

The research work was done during the raining season between the months of June and July which is usually characterized by low temperature. Failure to maintain a constant room temperature may have contributed to the increase in mortality rate of the offsprings.

Conclusion

In conclusion, these results have shown that ethanolic

extract of *O. gratissimum* has the potentials to reduce placental weight and birth weight, decrease litter size and accelerate early postnatal growth of offspring in both normal and diabetic conditions.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Determinants of satisfactory facility-based care for women during childbirth in Kumasi, Ghana

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Received 5 March, 2018; Accepted 3 April, 2018

The majority of deaths of women and infants during pregnancy and childbirth occur in Africa. Although many pregnant women seek antenatal care, in Ghana they do not all continue to seek facility-based care for childbirth. Complications that lead to mortality often occur around childbirth and these are not always possible to predict during antenatal care. This makes facility-based childbirth imperative for reduction in maternal and infant mortality. Satisfaction with childbirth care is recognized as a key influence for future utilization of the facility for pregnant women. This paper explores what women in Kumasi, Ghana perceive as satisfactory facility-based childbirth care. An exploratory qualitative study that enrolled 56 consenting women attending either antenatal or postnatal care in four public health facilities in Kumasi was conducted. Data were collected using in-depth individual interviews which were audio recorded and transcribed verbatim. Content analyses led to the emergence of themes that reflected participants' conceptualizations of satisfaction with facility-based childbirth care. Four themes emerged related to women's satisfaction with facility-based childbirth, namely: (i) receiving courteous and dignified care; (ii) having a consistent caregiver during childbirth; (iii) experiencing a positive birth outcome; and (iv) having a skillful care practitioner. Nurses and midwives should update their clinical skills and also be trained to provide patient-centered care to meet the expectations of women during childbirth in Kumasi, Ghana.

Key words: Satisfaction, childbirth, facility-based childbirth, Kumasi-Ghana.

INTRODUCTION

Worldwide, in 2015 an estimated 303,000 women died from pregnancy-related causes during the third trimester and 2.6 million babies were stillborn (Alkema et al., 2006; United Nations Maternal Mortality Estimation Inter-Agency Group Collaborators and Technical Advisory

Group, 2016; Blencowe et al., 2016; Lancet Stillbirth Epidemiology Investigator Group, 2016). It is noteworthy that more than half of these deaths occurred in Africa, and more so, that they could have been prevented by quality health care during pregnancy, labor, and delivery

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(WHO, 2014). Most of the complications that lead to maternal mortality occur during delivery and these are not easily predictable during the antenatal period (Crissman et al., 2012). Professional nursing care offers an opportunity to communicate with and support women and families during childbirth. It is argued that this leads to the development of a trusting relationship leading to satisfaction with care (WHO, 2014; Eghdampour et al., 2013; National Institute of Clinical Excellence (NICE), 2007; Birkhäuser et al., 2017). Satisfactory childbirth care may also positively affect a woman's bonding relationship with her child with subsequent implications for neonatal wellbeing (Baas et al., 2017).

The satisfaction of women with their facility-based childbirth care is a significant factor in their subsequent use of the facility for future childbirth and compliance with care (Oikawa et al., 2014; Tayelgn et al., 2011; Mehata et al., 2017). Moreover, experiences of disrespect and abuse during childbirth care have the potential to reduce women's satisfaction with health facilities (Magil-Cuerden, 2007; Kujawski et al., 2015; Moyer et al., 2013). Satisfactory childbirth care should meet the woman's personal expectations of receiving maximum support during care and building a trusting provider-patient relationship (Mehata et al., 2017).

When women have their expectations of labor and birth met, they are likely to be satisfied with care. A study in the United States of America (USA) found that personal control during childbirth was an important childbirth care requirement amongst participating women (Rominski-Danielson et al., 2016). A similar study in Australia found that having familiar faces engaging in the care process was important to satisfaction with birth care (Goodman et al., 2004). Similarly, the immediate maternal condition after birth, waiting time and the availability of waiting areas, as well as care provider and measures taken to provide privacy during examination, are factors that determined satisfaction with care among women studied in Ethiopia (Tayelgn et al., 2011). These studies demonstrate that women value sensitive and respectful relationships with competent clinicians who recognize and strive to provide them with patient-centered care.

In many African countries, including Ghana, skilled care is available only in health facilities, as skilled birth attendants usually do not attend home births. In health facilities skilled care is provided by doctors and nurses or midwives. However, due to the treatment women receive from facility-based care providers in Africa, many women opt for home births without skilled attendants (Lewis et al., 2016; Morad et al., 2013; Okafor et al., 2015; McMahon et al., 2014). In Ghana, only 42% of women seek facility-based care during childbirth (Ghana Statistical Service, 2009b). In 2017, the WHO (2017) reported Ghana had a maternal mortality rate of 319/100,000 live births. Health workers were reported to create barriers to care-seeking by being unwilling to assist pregnant women, beating women in labor, acting

rudely, and using abusive language (Dzomeku et al., 2017). A similar study in Lagos reported lack of sympathy and empathy, neglect, rudeness and verbally abusive behavior, inadequate attention from health care providers, and lack of privacy in skilled health care setting (Okafor et al., 2015). Some study participants explained that the midwife ought to hit women if they fail to push in labour to prevent the baby from dying (Rominsky et al., 2016). Poor treatment of women forms barriers to effective use of skilled childbirth care (Holmes and Goldstein, 2012) and suggests that there is a need for a patient-centered approach to health care provision, particularly childbirth care (The Health Foundation, 2014).

In patient-centered care, the health professionals work collaboratively with their clients and patients to ensure satisfaction with care (The Health Foundation, 2014). The benefit of the patient-centered health care approach is to involve patients in their care while enabling them to make informed decisions (The Health Foundation, 2014). Satisfaction with childbirth care is critical to avoid pregnant women feeling vulnerable at the time when they need health care most and to ensure continued use of health care services (Biringir et al., 2009). While we know its importance, there is a paucity of literature on what constitutes satisfactory facility-based childbirth care for Ghanaian women. This paper reports on the determinants of facility-based childbirth care for women in Ghana.

Guiding questions

1. What do women perceive as satisfactory in facility-based childbirth care?
2. What are women's expectations of a facility-based childbirth care?
3. What are women's experiences of facility-based childbirth care?

Definition of key terms

Women/midwifery clients: Antenatal or postnatal mothers who receive childbirth care from one of the four public health settings of this study.

Satisfaction: The desired expectations and experiences of women about their childbirth care from public health facilities.

Childbirth: the period from antenatal, labour and postnatal.

Patient-Centred care: An approach to care that meets patients' expectations of care

METHODOLOGY

Ghana has ten administrative regions, each with a regional capital.

This study was conducted in Kumasi. The Kumasi metropolis has 20 public health facilities that provide childbirth health care services. Four facilities, the only teaching hospital in the region, one district hospital, and two rural facilities, were selected for the current study based on these characteristics and to provide a perspective of women receiving care in both rural and urban settings. Midwifery clients receiving health care services at antenatal or postnatal clinics in these four public health facilities constituted the study population. Purposive sampling strategies were used to recruit participants, and only participants who gave written consent were interviewed. Inclusion criteria were antenatal or postnatal women with no complications with their current pregnancies, who are regular patients at the facilities in which they were approached, and were willing to participate in the study. Between 12 and 15 individual interviews were conducted in each of these facilities yielding a total of 56 participants for the study.

Using an exploratory qualitative research approach, an interview guide, with probing questions, guided the determinants of satisfactory facility-based care for women during childbirth in Kumasi, Ghana. Individual in-depth interviews were recorded with the consent of participants using an interview guide. The interview guide had questions such as; what were your experiences with facility-based childbirth care, what were your expectations of facility-based childbirth care, what made you satisfied with facility based childbirth care? The researchers conducted four interviews a day and allowed two-week intervals between data collection days, allowing adequate time for listening to the tapes several times, transcribing, reading the text, and identifying further probes. Each interview lasted for between 45 to 60 min. This process of simultaneous transcription allowed an opportunity for further exploration during the next set of interviews with other participants. Data collection ran from December, 2014 to April, 2015 for six weeks in each facility. Data collection ceased in each setting once data saturation occurred (Morse and Field, 1995). Interviews were conducted in Twi (a local language). They were translated and transcribed into English, and then back translated to ensure that content was accurate. Using content analysis, data was analyzed by first reading through the transcripts several times to familiarize with the text. Data was then coded and similar codes were put together to form themes.

Ethics

Permission to conduct the study was obtained from the ethics committees of the Kwame Nkrumah University of Science and Technology, Kumasi and Komfo Anokye Teaching Hospital. Informed consent was sought and obtained by explaining the study and their role to participants. Permission was also sought and obtained to record interviews. Only consenting participants were involved in the study after their verbal approvals were obtained. Trustworthiness of the study was ensured by accurately identifying participants who met the study inclusion criteria. Colleague researchers and participants were engaged in peer debriefing and member check throughout the data collection period in order to ensure the quality and integrity of research questions and transcripts.

RESULTS

Table 1 shows the biographic data of women in this study. Participants were between the ages of 18 and 46 years. Approximately 2% had a basic level education; 32% had junior high school education; 23% had senior high school education; 16% has tertiary level education,

and approximately 27% had no formal education. 34% were unemployed, 48% had informal employment, and 18% had formal employment. Four themes, each illustrating participants' satisfaction with facility-based childbirth care emerged from the data and are presented below. The themes were based on participants' anticipations of and/or prior knowledge and experience of facility-based childbirth care, namely: (i) receiving courteous and dignified care, (ii) having a consistent caregiver during childbirth, (iii) experiencing a positive birth outcome, and (iv) having a skillful care practitioner.

Courteous and dignified care

Some participants in this study described the childbirth care provided by the facility-based midwives as thoughtful and the midwives as having 'good manners'. Patients attributed this courteousness and dignified care to professionalism. Participants were satisfied when they perceived midwives as having time for them. They recommended that midwives should not be in a hurry to dismiss them during an appointment, but take due care to address all their needs.

"The midwife had all the time for me to answer my questions, even though we were many [women in the facility]. She was calm and cool about her work. She is what a midwife should be". [Woman from Ksouth 7, aged 31].

The participants also were impressed by, or wanted to have, a reliable caregiver who was present and willing to help at all times.

"The midwife was ready to help me at all times, I like her". [Woman from Ayid, aged 27].

This willingness made women feel like they were being well treated. Not only was the midwives' presence important to participants' satisfaction with care but also their willingness to offer help and when women felt they could relate to them.

"She was approachable, I could relate to her freely". [Woman from Ksouth, aged 26].

Some participants also reported that their midwives treated them cordially. Women found this when midwives greeted them and/or responded appropriately to their greetings.

"The midwives were nice to me, also friendly, patient, and treated me as if I was one of them. They were patient and responded to our greetings. They showed interest in me and ask about my health and wellbeing". [Woman from Apat, aged 25].

This also made women feel welcome at and comfortable

Table 1. Description of participants' characteristics

Parameter	Total	Percentages
Age (years)		
< 20	2	3.6
21-30	27	48
31-40	25	44.6
41-50	1	1.8
Unknown	1	1.8
Formal Education		
Basic	1	1.8
Junior High School(JHS)	18	32
Senior High School (SHS)	13	23
Tertiary	9	16
None	15	26.8
Employment status		
Formal	10	17.9
Informal	27	48
Unemployed	19	33.9

in the facility. Visitors are received warmly with a smile and a handshake, signifying acceptance, in a manner consistent with Ghanaian culture.

"I expect midwives to receive patients with a smile, it is what you expect when you go to someone's house". [Woman from Ayid aged 29].

Participants in this study also expected the midwives to show them similar welcoming gestures, as culture demands. It was key to women in this study that they received dignified care from providers; this is when their bodies are respected.

"The midwife should not just come to me and start asking me to part my legs for vaginal examination without any explanation and permission. It will not make me feel good at all". [Woman from KATH 2, aged 32].

Women expected particularly their genitalia to be protected and respected as much as possible.

"In my previous childbirth in the facility, I did not receive any explanations before vaginal examinations were done. I was not happy about that at all". [Woman from KATH, aged 40]

Participants expected to provide consent before any invasive procedures. As one woman argued, being asked permission would help her feel that she was part of the process.

"The midwife should tell me what she want to do and

seek my opinion, then I will feel that I am part of what is going on" [Woman from Ayid, aged 28].

When women were informed, they felt that their bodies and their person were respected. Non-consensual vaginal examination made women feel vulnerable and potentially degraded during care.

"I don't imagine the midwife to walk up to my bed with a tray and think that I know that she is going to perform vaginal examination. I will be very helpless if that happens". [Woman from Ksouth, aged 42].

Non-consented care could also be experienced as an abuse leading to dissatisfaction with care. For satisfaction with care, participants said they desired a cordial relationship with their care providers and respect for their body particularly their genitalia. When respect was not forthcoming from the midwives, it leads to dissatisfaction with care.

Desire for consistent care from a provider

Women in this study reported feeling satisfied with care when it was provided consistently by a care provider that they were familiar with. The perception was that a familiar midwife would be more likely to ensure their safety, because the midwife would be more committed to their care and their baby's well-being.

"I was praying to see a familiar face that is a midwife whom I am accustomed to, or one that I have met during

my antenatal care earlier. The midwife I met when I came here in labor was not someone I had met before. I was so disappointed when I first met her, because I do not know her and how safe she can deliver my baby. But she did well, because she was patient and kind to me". [Woman from Ayid, aged 30].

Moreover, participants expected that the care provider should get to know them during antenatal clinic visits.

"Knowing the midwife before the childbirth I think will make a lot of difference." [Woman from Apart, aged 42].

Some participants felt that they did not belong when they met their midwife for the first time during childbirth.

"You feel like a total stranger in a facility you have always been when you meet a new midwife on each visit and in childbirth." [Woman from Ksouth, aged 37 years].

Having a familiar midwife appeared to contribute to a woman's satisfaction with the childbirth experience. Being with a familiar person also provided women with an opportunity to discuss their fears and anxieties ahead of childbirth, as seen below:

"One thing that I have always wished for is that I will be given one midwife that takes care of me throughout my pregnancy and birth. Then, I know she knows me well, I will not be anxious at all. That will be fulfilling!" [Woman from Ksouth, aged 26].

Participants in this study expected the healthcare system to offer them a consistent and familiar care provider with whom they can identify throughout their childbearing cycle.

Expected positive birth outcomes

Another theme relevant to women's satisfaction with childbirth was the experience of a positive birth outcome. Participants in this study considered having a safe vaginal birth, having a living and healthy baby, and being healthy mothers, as positive birth outcomes, leading to their satisfaction with care.

"I am expecting to deliver safely, have my baby alive and be in good health. I know that there are some women who have complications in birth which can threaten their own lives or the life of their babies". [Woman from KATH, aged 38].

Alternatively, having a caesarean birth, even when mother and baby were healthy, was considered to be a negative birth outcome. This is evident in the following comment:

"My co-tenant delivered a few weeks ago it did not go

well with her because she had a caesarean section. I pray that I have a safe birth". [Woman from Ksouth, aged 25].

This statement reflects women's perception of a positive birth outcome.

"In our family all women have a good outcome, they deliver by themselves. It is not good to be helped to deliver." [Woman from Ksouth, aged 42].

Another participant's response shows her perception of the relationship between vaginal birth and her womanhood.

"In my previous childbirths, I delivered by myself and that makes me feel good as a woman, am expecting to deliver again without assistance." [Woman from Ayid, aged 36].

Women in this study perceived only a vaginal birth as a positive birth outcome leading to satisfaction with the childbirth experience and care. They considered only going through the natural process of childbirth as successful.

Skillful nursing practices

Generally, all midwives, throughout their training, learn critical skills for the management of reproductive health care issues, including the management of normal pregnancy, labor, and the puerperium. As part of their skills, they are able to detect abnormality and manage the birth process and/or refer to the relevant departments or personnel. Participants expect the professional knowledge of midwives to support them in order to have vaginal birth.

"In terms of birth or conducting of the birth process, midwives do just what they have to do. The baby was not coming out well and that was why I was brought here. With the midwives efforts, everything went well. I did not have any surgery. I am very happy." [Woman from KATH, aged 40].

Women trusted their midwives to ensure that they received what they perceived as safe care. Safe care meant having a vaginal birth with mother and baby in a good condition.

"When the midwife examines you and tells you something about your baby, be sure that it is exactly the case. After examining me, she said I will deliver in the next 5 hours and this is what happened". [Woman from Ksouth, aged 22].

Participants were very confident that midwives had the skill to help them through their childbirth in order for them

to have a safe and natural birth. Another participant noted:

“The midwife is very skillful, I was brought to the hospital after a difficult labor at home, but the way she went about it, they have been trained. I will not stay at home anymore; I will rather come early to the hospital”. [Woman from Apat, aged 34].

Participants had confidence in the midwives to see them through labor because of their training and expertise.

“The hospital is the last stop once you come, the midwives are able to help you. You know it’s their job and they know it”. [Woman from KATH, aged 40].

Yet another participant recounted having had an encouraging experience with her care during the puerperium.

“I gave birth to twins. After the first twin, I was so exhausted. They [the midwives] encouraged me to help myself so that they can support me and honestly they did well. They gave me an intravenous infusion and monitored me until the second twin came out. They afterwards monitored my blood pressure until I was completely stable. They cleaned me up and sent me to a neatly prepared bed to rest and breastfeed them”. [Woman from Ksouth, aged 26].

As noted earlier, participants also appreciated the supportive skills of the midwife after they delivered.

“The midwife came to assist me to put my baby to breast, I was happy because I did not know how to do that”. [Woman from Ayid Aged 38].

Participants in this study talked about needing skillful care throughout the childbirth period, including during the puerperium, and with the care of the baby. It appears from the results of our study that the experience of, and perceived skills of, the midwives were a strong factor for satisfaction with facility-based childbirth care.

DISCUSSION

This study identified that participating women in Kumasi expect to receive courteous and dignified facility-based childbirth care. Participants expected their interactions with the providers to be cordial, that their views and perspectives would be sought and respected by the health care providers, and that they would receive adequate responses to their queries, questions, and concerns, consistent with a patient-centered approach to care. The literature reports that seeing clients as individuals and considering their views during care provision equates to

dignity in care as this leads to the physical, emotional, and spiritual needs of clients being attended to, which is patient-centered care (WHO, 2014). Midwifery clients require emotional, physical, and advocacy support, particularly during labor (WHO, 2014; Royal College of Midwives, 2012). Participants in this study wanted forms of support that build their confidence in their ability to go through the process of labor and also to manage their pain. Our findings concur with those other researchers who found that failure to include women directly in decision-making processes and refusing to make and maintain eye contact during conversation or examination decreased women’s self-confidence and their satisfaction with care (Crissman et al., 2012; Morad et al., 2013; Doherty, 2010). Women in this study desired to be involved in the care process in order to ensure safe delivery, and this led to satisfaction with childbirth care. Meeting women’s expectations about childbirth care leads to satisfaction with care.

In the context of this study, participants expected to have familiar midwives taking care of them throughout the maternal health care continuum. It was noted that having a familiar caregiver strengthened the relationship between the women and the midwives and made it possible to plan successfully for the future. This is supported by evidence that women desire predictability of provider during their pregnancy and childbirth care, and that women need to maintain client/midwife relationships (Doherty, 2010). This finding echoes the findings of other researchers who reported that having different care providers can lead to the dissatisfaction of women (Goberna-Tricasa et al., 2011). The relationship with a midwife who monitors childbirth helps build trust between the client and the provider. Most women preferred a trusting relationship with their care providers because they felt vulnerable and wanted to be comforted by a familiar person (Royal College of Obstetricians and Gynaecologists (RCOG), 2007). This implies the need for familiarity throughout pregnancy and labour. This form of familiarity in a low resourced country like Ghana will be challenging to provide because of the severe health manpower shortages (Naicker et al., 2009). Despite this difficulty, focused antenatal care can be provided as a component of patient-centered care, where the same team of care providers sees the woman through her pregnancy and delivery. This may provide some of this familiarity that women desire in childbirth care (RCM, 2012) and will require planning and changing nursing and midwifery care from the current task orientation to patient-centered care, in order to ensure satisfaction with care.

Participants in this study wanted support and attention during childbirth, something supported by the evidence (Royal College of Midwives (RCM), 2012). Best practice recommends that all women in labor should receive one-on-one patient/midwifery support in established labour (RCM, 2012). However, this may remain a wish in many

African countries because of the human resource challenges facing the systems in Africa where there are 2.3 providers per 1000 population compared to 24.8 providers per 1000 population in the USA (Naicker et al., 2009).

For women in this study, having a caesarean birth is not considered a satisfactory outcome. This finding is consistent with a study in Nigeria where 81% of women reported that they would refuse caesarean section if required, even to save their own lives and those of their neonates. This is attributed to what the authors describe as inaccurate cultural perceptions of labor and caesarean section (Aziken et al., 2007). In certain African settings, women are expected to go through vaginal birth as a signifier of their womanhood, and interventions in childbirth mean this may be compromised.

Women in this study seemed to perceive that the midwives supporting them in childbirth were highly skilled. Women reported that midwives were able to intervene in difficult labors and assist them to deliver safely. Women appreciated the midwives' perceived skills particularly when they had been in labor with unskilled birth attendant without progress or had bad experiences in the past. These findings were supported by previous research showing that most clients are satisfied with the physical support and skills of midwives when in labour (Eghdampour et al., 2013; NICE, 2007). The findings also support observations by other researchers that dissatisfaction with facility-based childbirth care originates from the perceived lack of, or inadequacy of skillful care (Kujawski et al., 2015). Access to skilled care has been identified as a challenge to reducing maternal mortality; and overcoming this requires competent health providers as well as an environment in which they can perform effectively (Graham et al., 2001). Measures to improve skilled birth care is particularly important when 15% of all births are complicated by a potentially fatal condition that requires emergency care (WHO, 2014); and a skilled provider can recognize the onset of complications, perform essential interventions, start treatment and supervise the referral of situations beyond his/her capabilities and/or that of her facility (WHO, 2017). Women in this study perceived the skills of the midwives as contributing to their satisfaction and this affected their decision to choose facility-based childbirth care over birth at home. This finding is consistent with evidence that women's satisfaction with care during childbearing leads to repeat use of facility-based childbirth and to recommending it to others (Dzomeku et al., 2017; Institute of Medicine, 2012). This study demonstrates that, to consider childbirth care satisfactory, women require patient-centered care that meets their expectations and experience.

Implications for practice

We identify the need for midwives to:

- (i) enforce the practice of focused antenatal care initiative to ensure increased familiarity with a provider;
- (ii) provide friendly and patient-centered care to women during childbirth;
- (iii) respect the dignity, womanhood, and individuality of all women during care;
- (iv) approach women sensitively and receive consent for all invasive procedures;
- (v) include and inform women in and about their care;
- (vi) intensify education of women about indications for interventions such as caesarean section during childbirth;
- (vii) provide continuous professional development for midwives to sharpen their skills and ensure they remain relevant.

Limitations

This study did not consider other factors that may affect satisfaction with care such as the educational and socio-economic backgrounds of participants, their parity, the availability of facilities, and the environment within the health facility.

Conclusion

The study revealed that multiple factors may influence women's satisfaction with facility-based childbirth care in Kumasi including courtesy and dignity in care, communication and involvement, familiarity with care providers, positive birth outcome, and the skills of the midwife. These factors reflect women's anticipation of and their understanding of facility-based childbirth care which ought to be considered in the provision of care by providers. Skilled providers offering patient-centered care services are pivotal to the reduction of maternal mortality, therefore attention should be given to both the hard and soft skills development of providers. This study has provided evidence for the need to further provide professional development to midwives.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

Authors thank the participants who shared their expectations with us and the Metro Director for Ghana Health Service who facilitated access to the hospitals for data collection. The support of the Kwame Nkrumah University of Science and Technology, Kumasi and the Social Innovation in Public Health Impulse (SIPHI) fellowship program, University of Western Cape, South Africa is appreciated. Finally, the efforts of the research assistants David Ameyaw, Thomas Hinni and Precious Duodu during data collection and transcription are highly

appreciated; along with the Pre-Publication Support Services (PREPSS) of the University of Michigan who supported the development of this manuscript by providing pre-publication peer-review and copy editing.

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