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Knowledge of Birth Preparedness and Complication Readiness and Associated Factors among Pregnant Women in Ibadan, Nigeria

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ABSTRACT

Background: Globally, maternal mortality is a public health challenge, especially in developing countries such as Nigeria. Birth preparedness and complication readiness (BPCR) has been identified as a key strategy in reducing maternal death. Hence, the importance of identifying factors promoting BPCR to achieve the third Sustainable Development Goal. Therefore, this study assessed knowledge of BPCR among pregnant women, and identified associated factors.

Methods: A descriptive cross-sectional research design was adopted for this study. A validated questionnaire was utilized for data collection from randomly selected 400 pregnant women receiving skilled antenatal care in semi-urban areas of Ibadan, Nigeria. Data were analyzed using SPSS version 22. Findings were presented using descriptive and regression analysis.

Results: The mean age of the participants was 27.2±5.0. Only 60.5% of the pregnant women have good knowledge of obstetric danger signs, 50% have good knowledge of elements of BPCR, and 61.5% have good recognition of skilled birth attendants. Occupation ($P = 0.005$), income ($P = 0.001$), and educational level ($P = 0.001$) were found to be associated with BPCR.

Conclusion and Recommendation: An average number of pregnant women have good knowledge of the three components of BPCR. Effective intervention to improve pregnant women's knowledge of BPCR is therefore recommended especially in Nigeria.

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Introduction

Every nation of the world recognizes the importance of maternal health, especially in relation to the development of a nation. Hence, maternal mortality is a public health challenge, especially in developing countries [1]. The global Maternal Mortality Rate (MMR) of 810 per 100,000 live birth is still unacceptable to the global communities, and it is more worrisome when developing countries contribute 94% of maternal death [2]. Consequently, more women in developing countries are likely to die from problems related to pregnancy and childbirth. Nigeria has been identified by the World Health Organisation (WHO) as one of the countries that contribute a higher percentage to global maternal death with an estimated 58,000 women dying in relation to pregnancy or/and childbirth annually [3]. The MMR in Nigeria is 512 per 100,000 live births while in Oyo state it is estimated to be 260 per 100,000 live birth [4,5].

In Nigeria, Sageer et al reported that maternal deaths have been associated with five direct causes namely; hemorrhage, Pre-eclampsia/eclampsia, infection, ruptured uterus and complications of unsafe abortion [6]. Also, indirect causes such as cancer-related deaths and cardiac deaths in women with pre-existing heart

disease have been documented [7]. However, these maternal deaths could be averted if pregnant women receive antenatal and delivery care from skilled birth attendants. Consequently, skilled birth attendance has been associated with birth preparedness and complication readiness [8]. Thus, proven interventions such as birth preparedness and complication readiness (BPCR) has been reported to be effective in preventing maternal death especially in developing countries like Nigeria [9].

Birth Preparedness and Complication Readiness awakens the consciousness of pregnant women, families, care providers, and all stakeholders in the community to observe warning signs when present. This will enhance timely presentation at the hospital resulting from early recognition of warning signs. The process of BPCR also encourages pregnant women and all those involved in decision-making to plan ahead for delivery. The planning will include; securing transportation, saving money to pay for hospital care, and identifying a potential blood donor to be able to facilitate decision-making whenever the need arises [10].

Previous studies have reported different levels of BPCR among pregnant women. In Ethiopia, Bogale et al reported only one-quarter of 604 pregnant women studied had good BPCR. In Nigeria however, previous studies' report on the level of BPCR among pregnant women vary. There is limited information on whether

pregnant women received skilled antenatal care [11-13].

In addition, different factors have been associated with good BPCR in different countries and regions. In Tanzania, Moshi et al reported factors such as age, ethnicity, distance to the health facility, previous maternal experience, and media awareness [14]. Similarly, in South-Eastern Nigeria, Ilohalu et al assumed that level of education and regular antenatal visit are major factors associated with BPCR [15]. However, there is a dearth of information on factors associated with BPCR among pregnant women receiving skilled antenatal care in Ibadan, South-Western Nigeria. Therefore, this study aimed at assessing the practice of BPCR among pregnant women receiving skilled antenatal care based on the three components of practicing BPCR; the knowledge of obstetric danger signs, knowledge of elements of BPCR, and knowledge/recognition of a skilled birth attendant. This study further identified factors associated with the different components of BPCR among pregnant women receiving skilled antenatal care.

Methods

Study Design

This study was a baseline study of an intervention study. The study adopted a descriptive cross-sectional research design, a quantitative approach was used for data collection. This study was designed to assess factors influencing BPCR among pregnant women in Ibadan, Nigeria.

Study Setting

This study was conducted in two selected semi-urban local government areas (LGAs) of Ibadan. They are Oluyole and Akinyele LGAs. They are two out of 11 local government areas in Ibadan. They are classified as semi-urban (less city) LGAs of Ibadan the capital city of Oyo state. Oyo state is one of the six states in South-Western Nigeria.

Sampling Technique

A three-stage sampling technique was used for the quantitative part of the study. The first stage involved simple random selection (through balloting) of two out of six semi-urban LGAs in Ibadan. Two selected LGAs were Oluyole and Akinyele LGAs. The second stage included drawing a list of all the primary healthcare centres (PHCs) in each local government, Ojoo and Moniya (out of 13) PHCs were purposively selected based on the high client flow from Akinyele LGA while Adaramagbo and Odo-ona elewe PHCs were randomly selected out of four PHCs with highest client flow from Oluyole LGA. At the third stage, all antenatal clinic attendees who met the inclusion criteria at each visit were purposively selected to participate in the study.

Sample Size Determination

The sample size was calculated according to the sample for proportions formula by Charan & Biswas with a 95% confidence level and 0.05 precision to yield a representative sample of 400 pregnant women recruited for the study [16].

Instrument

The study adopted a semi-structured/structured questionnaire from 'Monitoring BPCR tools and indicators for maternal and new-born health' developed by Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO, 2004). The instrument was modified following rigorous review of the literature based on relevance to the study and the study setting.

Validity of Instrument

The "Monitoring birth preparedness and complication readiness instruments and indicators for maternal and new-born health" created by the Johns Hopkins Program for International Education in Gynaecology and Obstetrics were transformed into a validated instrument (semi-structured/structured questionnaire) (JHPIEGO, 2004). Researchers, clinicians (practitioners), and statisticians in the fields of reproductive, maternal, and child health collaborated to make changes to the instrument. The instrument was also revised based on reviewer feedback and outcomes from the pilot test.

Reliability of Instrument

The reliability of the instrument was conducted to assess the psychometric properties and ensure the adaptability of the instrument to the study setting. A test-retest reliability test was conducted. The same questionnaire was administered twice to 30 antenatal clinic attendees in the Egbeda Local Government area with the second administration coming two weeks after the first. Also, back-to-back translation of the instrument (English and Yoruba language) was done to ascertain its reliability of the instrument. The correlation coefficient of scores from Time 1 and Time 2 was obtained in order to evaluate the test for stability over time. The results of the reliability tests were found to be 0.8. Hence, the instrument was considered to be reliable.

Procedure for Data Collection

The researcher and two trained research assistants visited the selected PHCs on the antenatal clinic days. Eligible participants with an estimated gestational age of 20 – 24 weeks were recruited for the study and were informed of the objectives of the study. The interviewer-administered questionnaire was administered to the recruited pregnant women face-to-face during the antenatal clinic visit. Respondents were guided by the researcher and the trained research assistants in the completion of the questionnaire.

Method of Data Analysis

Preliminary checking of the questionnaires was carried out for errors. The data were entered into IBM - SPSS version 22. Percentages were used to summarize categorical variables, while mean, median, and standard deviation were used to summarize continuous variables. Relevant tables and figures were used in presenting some of the results. The statistical significance of the independent variables' effect was set at $p < 0.05$. The data were analysed based on the research objectives.

Ethical Consideration

The researcher submitted a study proposal as well as an application for approval to conduct the study to the UI/UCH Ethics Review Committee in Ibadan prior to the commencement of data collection. The ethics review committee gave its approval. The objectives of the study and the purpose of the research as an academic endeavour were explained to the participants. This is to ensure that all participants accept to participate voluntarily, and give their informed consent. The participants were also informed that any information collected during the course of the study would be kept confidential. Identification numbers and names were indicated on the research documents.

Furthermore, the instrument was translated to the local language at the study setting (Yoruba) and then back to the English language by another person. This ensured adequate understanding of the study by the participants as well as appropriate completion of the questionnaire. In addition, ethical principles of research were taken into consideration during the study.

Results

A total number of 400 pregnant women were recruited for the study, the mean age of the participants was 27.2±5.0, while 65.5% of them were between the ages of 20-29 years. More than half of them (60.8%) have a secondary school education. More than half of the participants (68.0%) earned less than the minimum paid salary in Nigeria, while 38.0% of them were artisans as shown in Table 1 below.

Table 1: Socio-Demographic Characteristics of Pregnant Women Receiving Skilled Antenatal Care in Ibadan

Variable	Frequency (n = 400)	Percentage (%)
Age		
Less than 20 years old	18	4.5
20 - 29 years old	262	65.5
30 - 39 years old	115	28.7
40 -49 years old	5	1.3
Marital Status		
Single	27	6.8
Married	373	93.2
Highest level of education		
No formal education	9	2.3
Primary education	29	7.3
Secondary education	243	60.8
Tertiary education	119	29.8
Religion		
Christianity	171	42.8
Islam	229	57.2
Ethnicity		
Yoruba	368	92.0
Igbo	17	4.3
Hausa	7	1.8
Others	8	2.0
Monthly Income		
Below 20,000 naira	272	68.0
20,000 – 40,00 naira	95	23.8
40,000 – 60,000 naira	26	6.5
60,000 – 80,000 naira	4	1.0
Above 80,000 naira	3	0.8
Participant's occupation		
Clerical/Skilled Artisans	152	38.0
Sales and services	138	34.5
Professional/Managerial	59	14.8
Unemployed	51	12.8

Table 2: Knowledge of BPCR among Pregnant Women Who Received Skilled Antenatal Care in Ibadan, Nigeria

Knowledge of obstetric danger signs	Frequency (N=400)	Percentage (%)
Bleeding	267	66.8
Severe headache	193	48.3
Convulsion	225	56.3
Swollen hands/ feet	172	43.0
High fever	221	55.3
Fainting	228	57.0
Severe weakness	211	52.8
Severe abdominal pain	218	54.5
Leaking water from vagina	193	48.3
Abnormal baby movement	188	47.0
Blurred vision	173	43.3
Knowledge of Elements of BPCR		
Save money	389	97.3
Identify mode of transportation	327	81.8
Identify blood donor		55.8
Identify skilled provider	302	75.5
Identify birth location	368	92
Obtain basic safe birth supplies	375	93.8
Identify whom to keep company	305	76.3
Identify temporary family carer	305	76.3
Knowledge/Recognition of A Skilled Birth Attendant		
A registered nurse	364	91.0
A registered midwife	365	91.3
A doctor	384	96.0
A traditional midwife	179	44.8
All hospital workers	69	17.3
A mother	53	13.3
Any old woman who has assisted in taking delivery previously	95	23.8
Any lady or woman wearing white uniform	54	13.5
Skilled birth attendants work at healthcare facilities	170	42.5

A total of 60.5% of pregnant women have good knowledge of obstetric danger signs, half of the respondents (50%) have good knowledge of elements of BPCR, while 61.5% have good recognition of SBAs (Table 3).

Table 3: Categorical Level of Knowledge of Birth Preparedness and Complication Readiness among Pregnant Women in Ibadan

Variable	Frequency (N=400)	Percentage (%)
Knowledge of obstetric danger signs		
Good knowledge	242	60.5
Poor knowledge	158	39.5
Knowledge of elements of BPCR		
Good knowledge of BPCR elements	200	50.0
Poor knowledge of BPCR elements	200	50.0
Recognition of Skilled Birth Attendant		
Good SBA Recognition	246	61.5
Poor SBA Recognition	154	38.5

Results as presented in table 4 below show clearly that only the occupation (P = 0.005) of the pregnant women is associated with their knowledge of obstetric danger signs. It reveals that pregnant women who are traders are more likely (OR = 2.52) to have better knowledge of obstetric danger signs in pregnancy than their counterparts who are either artisans (OR = 1.87) or managers (OR = 1.00) at a confidence interval of 95%.

Table 4: Factors Associated with Knowledge of Obstetrics Danger Signs among Pregnant Women in Ibadan

Variable	Good knowledge (n = 242)	Poor knowledge (n = 158)	P-value	aOR of Good knowledge aOR(95%CI)
Age				
< 20 years	9 (50.0)	9 (50.0)	0.878	1
20 – 24 years	66 (61.7)	41 (38.3)		0.60 (0.17 – 2.10)
25 – 29 years	92 (59.4)	63 (40.6)		0.98 (0.41 – 2.33)
30 – 34 years	49 (62.0)	30 (38.0)		0.83 (0.38 – 1.80)
35+ years	26 (63.4)	15 (36.6)		0.87 (0.38 – 1.99)
Marital Status				
Single	16 (59.3)	11 (40.7)	0.891	1
Married	226 (60.6)	147 (39.4)		0.95 (0.40 – 2.28)
Level of Education				
Below/incomplete secondary	45 (69.2)	20 (30.8)	0.261	1
Complete secondary	129 (59.7)	87 (40.3)		0.50 (0.25 – 0.99)
Tertiary	68 (57.1)	51 (42.9)		0.64 (0.28 – 1.45)
Occupation				
Professional/Managerial	33 (55.9)	26 (44.1)	0.005*	1
Clerical/skilled artisans	101 (66.4)	51 (33.6)		1.87 (0.81 – 4.32)
Sales and services	88 (63.8)	50 (36.2)		2.52 (1.21 – 5.25)
Unemployed	20 (39.2)	31 (60.8)		2.26 (1.06 – 4.82)
Income				
Below 20,000 naira	163 (59.9)	109 (40.1)	0.358	1
20,000 – 40,000 naira	62 (65.3)	33 (34.7)		1.20 (0.71 – 2.02)
> 40,000 naira	17 (51.5)	16 (48.5)		0.72 (0.33 – 1.59)
Previous pregnancy				
No	104 (56.8)	79 (43.2)	0.168	1
Yes	138 (63.6)	79 (36.4)		0.95 (0.58 – 1.56)
Gestational age				
First trimester	3 (50.0)	3 (50.0)	0.290	1
Second trimester	233 (61.3)	147 (38.7)		0.95 (0.17 – 5.30)
Third trimester	6 (42.9)	8 (57.1)		0.67 (0.07 – 6.32)
Gestational age at booking				
First trimester	53 (56.4)	41 (43.6)	0.369	1
Second trimester	186 (62.2)	113 (37.8)		1.39 (0.83 – 2.33)
Third trimester	3 (42.9)	4 (57.1)		0.98 (0.12 – 7.79)

The results as presented in Table 5 show that a few sociodemographic characteristics such as age ($P = 0.001$), marital status ($P = 0.01$), and income ($P = 0.001$) are associated with pregnant women's knowledge of elements of BPCR. Also, women who are pregnant for the first time ($OR = 1.00$) are more likely to have a better knowledge of elements of BPCR than their counterparts who are not. Likewise, pregnant women who registered for antenatal care during the first trimester ($OR = 1.00$) are more likely to have a better knowledge of elements of BPCR than their counterparts who either registered during the second trimester ($OR = 0.36$) or the third trimester ($OR = 0.02$) at the confidence interval of 95%.

Table 5: Factors Associated with Knowledge of Elements of Birth Preparedness and Complication Readiness

Variable	Good knowledge (n = 200)	Poor knowledge (n = 200)	P-value	aOR of Good knowledge aOR(95%CI)
Age				
< 20 years	6 (33.3)	12 (66.7)	0.001*	1
20 – 24 years	42 (39.3)	65 (60.7)		1.43 (0.38 – 5.39)
25 – 29 years	82 (52.9)	73 (47.1)		1.54 (0.64 – 3.72)
30 – 34 years	53 (67.1)	26 (32.9)		1.78 (0.81 – 3.90)
35+ years	17 (41.5)	24 (58.5)		3.39 (1.43 – 8.02)
Marital status				
Single	7 (25.9)	20 (74.1)	0.010*	1
Married	193 (51.7)	180 (48.3)		1.82 (0.70 – 4.74)
Level of education				
Below/incomplete secondary	28 (43.1)	37 (56.9)	0.192	1
Complete secondary	105 (48.6)	111 (51.4)		1.55 (0.79 – 3.04)
Tertiary	67 (56.3)	52 (43.7)		2.47 (1.06 – 5.72)
Occupation				
Professional/Managerial	27 (45.8)	32 (54.2)	0.900	1
Clerical/skilled artisans	77 (50.7)	75 (49.3)		0.41 (0.16 – 1.02)
Sales and services	71 (51.4)	67 (48.6)		0.77 (0.36 – 1.67)
Unemployed	25 (49.0)	26 (51.0)		0.49 (0.22 – 1.10)
Income				
Below 20,000 naira	121 (44.5)	151 (55.5)	0.001*	1
20,000 – 40,000 naira	64 (67.4)	31 (32.6)		2.27 (1.31 – 3.94)
> 40,000 naira	15 (45.5)	18 (54.5)		1.14 (0.50 – 2.64)
Previous pregnancy				
No	71 (38.8)	112 (61.2)	< 0.001*	1
Yes	129 (59.4)	88 (40.6)		0.43 (0.25 – 0.72)
Gestational age				
First trimester	2 (33.3)	4 (66.7)	0.816	1
Second trimester	191 (50.3)	189 (49.7)		2.27 (0.44 – 16.68)
Third trimester	7 (50.0)	7 (50.0)		8.94 (0.71 – 113.34)
Gestational age at booking				
First trimester	63 (67.0)	31 (33.0)	< 0.001*	1
Second trimester	136 (45.5)	163 (54.5)		0.36 (0.21 – 0.64)
Third trimester	1 (14.3)	6 (85.7)		0.02 (0.001 – 0.40)

As presented in table 6, only the level of education ($P = 0.001$) of the pregnant women is associated with their knowledge/recognition of a skilled birth attendant. It is clearly shown that pregnant women who have tertiary education are twice likely ($OR = 2.11$) to have better knowledge or be able to recognize a skilled birth attendant than their counterparts who have either incomplete ($OR = 1.00$) or complete ($OR = 0.89$) secondary school education at the confidence interval of 95%.

Table 6: Factors Associated with Recognition of Skilled Birth Attendants

Variable	Good knowledge (n = 246)	Poor knowledge (n = 154)	P-value	aOR of Good knowledge aOR(95%CI)
Age				
< 20 years	8 (44.4)	10 (55.6)	0.262	1
20 – 24 years	62 (57.9)	45 (42.1)		0.46 (0.11 – 1.42)
25 – 29 years	96 (61.9)	59 (38.1)		0.56 (0.23 – 1.38)
30 – 34 years	50 (63.3)	29 (36.7)		0.54 (0.24 – 1.23)
35+ years	30 (73.2)	11 (26.8)		0.58 (0.24 – 1.39)
Marital status				
Single	14 (51.9)	13 (48.1)	0.286	1
Married	232 (62.2)	141 (37.8)		1.23 (0.51 – 2.97)
Level of education				
Below/incomplete secondary	35 (53.8)	30 (46.2)	0.001*	1
Complete secondary	121 (56.0)	95 (44.0)		0.89 (0.48 – 1.65)
Tertiary	90 (75.6)	29 (24.4)		2.11 (0.94 – 4.76)
Occupation				
Professional/Managerial	40 (67.8)	19 (32.2)	0.380	1
Clerical/skilled artisans	86 (56.6)	66 (43.4)		0.96 (0.40 – 2.35)
Sales and services	89 (64.5)	49 (35.5)		1.02 (0.48 – 2.17)
Unemployed	31 (60.8)	20 (39.2)		1.32 (0.60 – 2.90)
Income				
Below 20,000 naira	167 (61.4)	105 (38.6)	0.964	1
20,000 – 40,000 naira	58 (61.1)	37 (38.9)		0.79 (0.46 – 1.33)
> 40,000 naira	21 (63.6)	12 (36.4)		0.87 (0.39 – 1.96)
Previous pregnancy				
No	112 (61.2)	71 (38.8)	0.910	1
Yes	134 (61.8)	83 (38.2)		1.03 (0.62 – 1.71)
Gestational age				
First trimester	5 (83.3)	1 (16.7)	0.483	1
Second trimester	231 (60.8)	149 (39.2)		0.35 (0.03 – 3.49)
Third trimester	10 (71.4)	4 (28.6)		0.64 (0.04 – 11.32)
Gestational age at booking				
First trimester	62 (66.0)	32 (34.0)	0.607	1
Second trimester	180 (60.2)	119 (39.8)		0.79 (0.46 – 1.35)
Third trimester	4 (57.1)	3 (42.9)		0.40 (0.04 – 3.76)

Discussion

The findings of this study showed clearly the knowledge of BPCR in its three components; knowledge of obstetric danger signs, the knowledge of elements of BPCR, and the knowledge/recognition of a skilled birth attendant among pregnant women receiving skilled antenatal care. Factors associated with each component of this BPCR were also revealed.

Just about half of the pregnant women who participated in the study identified severe abdominal pain, severe weakness, fainting, high fever, convulsion, and two-thirds of the participants identified bleeding as a danger sign during pregnancy. However, bleeding was mostly identified by the participants. This could be because bleeding is a frightening experience for most women, and this has also been mentioned in another study conducted among Nigerian pregnant women. Also, many pregnant women would have heard of women dying from bleeding during childbirth, hence, the

high level of awareness of bleeding as a dangerous sign during pregnancy which could be a threat to many pregnant women. This could also be related high level of awareness of postpartum hemorrhage by women. Thus, postpartum hemorrhage has been identified as one of the direct causes of maternal deaths [17-19].

However, more than one-third of the participants had poor levels of knowledge of obstetric danger signs despite receiving skilled antenatal care. This is similar to another study conducted among pregnant women in Ethiopia [20]. The authors reported a very poor knowledge of obstetric danger signs in pregnancy among the pregnant women who participated in the study. This poor knowledge consequently led to the poor practice of BPCR [20]. This was also supported by Ijang et al who reported that knowledge of Obstetric danger signs was associated with the practice of BPCR among pregnant women [10]. More importantly, good knowledge of obstetric dangers signs in pregnancy has been indicated as one of

the factors promoting complication readiness as well as receiving timely emergency obstetric care [21]. Therefore, many pregnant women will still benefit from awareness programs and other interventions to raise awareness of these obstetric danger signs among pregnant women. More importantly, all pregnant women receiving skilled antenatal care should be educated on these danger signs to ensure receiving timely emergency obstetric care.

Also, most of the pregnant women who participated in this study identified saving money, obtaining delivery materials, and identifying the birth location as elements of BPCR. Saving money implies that pregnant women are aware that delivery services are not free in both public and private healthcare facilities in Ibadan, Nigeria. In addition, every pregnant woman is given a list of delivery materials to be needed in preparation for delivery by their care provider during antenatal care. This could be responsible for why the majority of the pregnant women were able to identify obtaining delivery materials as an element of BPCR. This is consistent with another study conducted by Deji et al in Nigeria. The authors reported that the majority of the pregnant women obtained materials necessary for labor and delivery care before the commencement of labor [17]. Therefore, it is recommended that care providers should continue with interventions that encourage the act of obtaining delivery materials among pregnant women.

It is worthy of note that half of the pregnant women in this study had poor knowledge of elements of BPCR, despite more than half of them are not first-time mothers. This could mean that previous childbirth experience did not influence their knowledge of elements of BPCR. This is contrary to the findings of Limenih et al who also assessed knowledge of elements of BPCR among pregnant women in Ethiopia. The authors reported that only one-quarter of pregnant women had poor knowledge of elements of BPCR. Also, income was found to influence knowledge of BPCR in this current study, pregnant women who earn higher income were found to be twice likely to have good knowledge of BPCR [20]. This is consistent with another study conducted among pregnant women in Cameroon [10].

Also, another implication could be that many of them have not received prenatal education focusing on BPCR. Therefore, skilled care providers should ensure that BPCR education is integrated into routine prenatal education so that pregnant women will be properly guided on adequate BPCR, which promotes skilled birth attendance, and consequently reduces maternal deaths.

A very high proportion of the pregnant women who participated in this current study recognized nurses, midwives, and doctors as skilled birth attendants. This is consistent with the globally acceptable description of a skilled birth attendant by the World Health Organization [22]. This group of healthcare providers has been adequately prepared by virtue of their training to manage normal labor, identify the development of a complication, and manage such a complication at any stage of pregnancy and childbirth. Thus, the availability of a skilled birth attendant during childbirth has been recommended for all pregnant women [23]. This is a major strategy for reducing maternal deaths, especially in developing countries like Nigeria.

Furthermore, this current study identified occupation as the only factor associated with knowledge of obstetric danger signs. Also, gestational age at antenatal registration, previous pregnancy experience, age, marital status, and income as factors associated with pregnant women's knowledge of elements of BPCR. In addition, pregnant women's level of formal educational attainment

was found to be associated with the recognition of a skilled birth attendant. This is consistent with another study conducted in Ghana and Tanzania [24,25]. The authors reported that women with higher formal education attainment had better BPCR than their counterparts with lower educational attainment. In addition, Saaka et al identified an association between women's age and BPCR [22]. They reported that higher BPCR was found among pregnant women of advanced age. Also, Shimpuku et al identified higher BPCR among women of higher economic class. Hence, reported an association between BPCR and the income of pregnant women [26].

Therefore, it is recommended that all stakeholders in maternal health should plan and implement various interventions that will promote factors associated with BPCR. This could improve skilled birth attendance and consequently reduce maternal deaths among pregnant women in developing countries.

Conclusion

Average number of pregnant women have good knowledge of obstetric danger signs, elements of BPCR, and skilled birth attendants, which are the three components of BPCR. The pregnant women's knowledge is associated with their age, occupation, income and level of education. Effective intervention to improve pregnant women's knowledge of BPCR is therefore recommended especially in developing countries like Nigeria.

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Conflict of Interest Disclosure

There is no conflict of interest for all authors.

Ethical Considerations

Ethical approval number UI/EC/18/0629 was obtained from the University of Ibadan/University College Hospital institutional review committee before the commencement of data collection. The objectives of the study were explained to the study participants, and informed consent was obtained. They were assured of the confidentiality of the information received and the right to opt out at any point of the study without any consequence.

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