ORIGINAL RESEARCH ARTICLE

Factors Associated with Postpartum Health Problems among Married Women of Reproductive Age in the Democratic Republic of the Congo: A Cross-sectional Study in Kenge City

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Abstract

Maternal mortality is attracting attention worldwide, but maternal health problems after delivery have received less attention. Most studies focus on prenatal maternal health problems. We aimed to identify factors associated with postpartum health problems among married women of reproductive age in Democratic Republic of the Congo. We employed a cross-sectional study design and randomly enrolled 700 married women of reproductive age in Kenge city. Data collection instrument was developed using the UNICEF Multiple Indicator Cluster Survey. T-test, chi-square test, and binary logistic regression analysis were performed using the SPSS version 24.0. Significant risk factors associated with postpartum health problems were initial postnatal care period; within 24 hours (Odds Ratio [OR]=2.197, 95% confidence interval [CI]: [1.156–4.174], p=.016); within 7 days (OR=1.972, 95% CI: [1.102–3.528, p=.022]; within 14 days (OR=2.124, 95% CI: [1.082–4.172], p=.029) among reproductive health and health service utilization characteristics. Health education by RECO (Relais Cmunataure) was associated with postpartum health problems including PCIME (Prise en Charge Integree des Maladies de l'Enfant; OR=1.845, 95% CI: [1.038–3.282], p=.037); hand washing (OR=1.897, 95% CI: [1.060–3.396], p=.031); malaria (OR=2.003, 95% CI: [1.192–3.366], p=.009) among Maternal and Child Health intervention characteristics. In conclusion, it is necessary to develop and promote health policies and educational programs focusing on PNC service within 24 hours, PNC services within 7 days, PCIME, hand washing, prevention of malaria. *(Afr J Reprod Health 2019; 23[3]: 30-41).*

Keywords: Postpartum Health Problem; Maternal health; Postnatal care; Democratic Republic of the Congo; Health education

Résumé

La mortalité maternelle attire l'attention dans le monde entier, mais les problèmes de santé maternelle après l'accouchement ont reçu moins d'attention. La plupart des études se concentrent sur les problèmes de santé maternelle prénataux. Nous avons cherché à identifier les facteurs associés aux problèmes de santé du post-partum chez les femmes mariées en âge de procréer en République Démocratique du Congo. Nous avons utilisé un plan d'étude transversal et avons recruté au hasard 700 femmes mariées en âge de procréer dans la ville de Kenge. L'instrument de collecte de données a été mis au point à l'aide de l'enquête par grappes à indicateurs multiples de l'UNICEF. Le test T, le test du Khi-deux et l'analyse de régression logistique binaire ont été réalisés à l'aide de la version 24.0 de SPSS. Les facteurs de risque significatifs associés aux problèmes de santé du post-partum étaient la période initiale de soins postnatals; dans les 24 heures (rapport de cotes [OU] = 2,197, intervalle de confiance à 95% [IC]: [1,156 à 4,174], p = 0,016); dans les 7 jours (OR = 1,972, IC 95%: [1,102–3,528, p = 0,022]; dans les 14 jours (OR = 2,124, IC 95%: [1,082–4,172], p = 0,029) chez les personnes en santé de la reproduction et les caractéristiques de l'utilisation des services de santé. L'éducation sanitaire assurée par RECO (Relais Cmunataure) a été associée à des problèmes de santé du post-partum, notamment à la prise en charge des maladies de l'enfant; OR = 1.845, IC 95%: [1.038–3.282], p =. 037), le lavage des mains (OR = 1,897, IC 95%: [1,060–3,396], p = 0,031); le paludisme (OR = 2,003, IC 95%: [1,192–3,366], p = 0,009) parmi les caractéristiques des interventions de santé maternelle et infantile En conclusion, il est nécessaire d'élaborer et de promouvoir des politiques de santé et des programmes éducatifs axés sur les services de SPN dans un délai de 24 heures, les services de SPN dans le délais de 7 jours, la PCIME, le lavage des mains et la prévention du paludisme. *(Afr J Reprod Health 2019; 23[3]:30-41).*

Mots-clés: Problème de santé du post-partum; santé maternelle, soins postnatals; République Démocratique du Congo; hygiène

Introduction

Leaders of the 189 United Nations countries adopted the Millennium Development Goals (MDGs) in September 2000 for ending world extreme poverty. The MDGs comprised of eight specific targets, and the slogan 'To improve maternal health' was adopted as the MDG 5. The maternal mortality ratio consistently decreased by 45 % between 1990 and 2013 since the adoption of the MDGs. Despite this worldwide effort, the World Health Organization (WHO) announced that 303,000 pregnant women were dying every year due to infections, disease, injuries and bleeding after delivery[1]. The UN member countries accepted the Sustainable Development Goals (SDGs) since the end of the MDGs era in 2016. The SDGs aim to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 (SDG 3.1)[2]. Despite these efforts, the maternal mortality ratio in the Democratic Republic of the Congo (DRC) is 693 per 100,000, which is about 3 times higher than the world maternal mortality ratio (216 per 100,000) and even higher than the average in sub-Saharan Africa (547 per 100,000)[3].

The causes of maternal mortality are complications from bleeding, eclampsia, sepsis and unsafe abortion. Furthermore, indirect causes of maternal mortality are human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) and malaria[4]. These causes can be prevented by visiting the health facility for health examination by a health professional[5,6]. Maternal mortality and neonatal mortality are attracting attention worldwide while the issue of maternal health problems after delivery has received less attention[5]. In addition, data and results of analyses on maternal health problems in developing countries are quite rare. Moreover, the majority of studies have focused on the prenatal maternal health problems[7]. Postpartum mothers generally perceive their health as good. However, postpartum women experience physical limitations in life due to postpartum suffering[8,9]. Mothers at 2 months postpartum have a high rate of backaches, sore nipples, breast tenderness, physical exhaustion and pain at the cesarean incision site[10]. The percentage of mothers at 18 months postpartum, who self-rated their health as "very good" or "good" were lower than the percentage of mothers at 2 months postpartum. Furthermore, the prevalence of health status indicators, such as tiredness, fatigue, backache and lack of sexual desire, increased over time[11-13]. In addition, the accessibility of information on health care is highly related to the health of postpartum mothers. The limited information available suggests a high prevalence rate of malnutrition (80%) among women and adolescents in rural areas[14,15].

The postpartum period is defined as the time after childbirth that is required for complete physical to return to non-pregnant health status, a process that takes approximately 6 weeks[16-18]. Postpartum mothers responded that they experienced a lot of fatigue during the postpartum period. Postpartum health problems appeared within 1 month and disappeared within 3 months[19-21]. Therefore, it is most effective to receive postnatal care (PNC) to prevent health problems during the postpartum period immediately after childbirth and within 7 days, 14 days and 42 days[22]. In the case of the DRC, however, the proportion of mothers who received postnatal care (44.6%) is lower than the average for sub-Saharan Africa (67%)[23-24].

Furthermore, 34.6% of mothers in the DRC experienced health problems during the postpartum period[25]. According to Gunlicks and Weissman's study, physical health and depression during the postpartum period was associated with improvement in neonatal health[25,26]. However, mental care of mothers, such as for depression, is not enough to improve the neonatal health[26-31]. Therefore, physical health together with the mental health of postpartum mothers is very important as this affects the neonatal health. Factors such as unintended pregnancy[32], educational level of mothers, occupation, age, monthly household income and postnatal care[33], affect maternal health during the postpartum period in developing countries.

The aim of study was to identify the risk factors associated with health problems among postpartum married women in the DRC and to improve their health. The objectives of the study were to investigate the different health problems during the postpartum period with respect to demographic and socioeconomic characteristics,

reproductive health and health service utilization characteristics, maternal and child health characteristics, and to identify the causes of postpartum health problems.

Methods

Study design and sampling

This study was part of the Korea International Agency's (KOICA) MCH project in the DRC by Yonsei Global Health Center in Republic of Korea. The MCH project was undertaken in collaboration with the School of Public Health, Kinshasa University (UNIKIN), DRC. This study was based on a cross-sectional design. The data were collected from November 23, 2016 to December 6, 2016.

The study target area was Kenge zone de Sante (health zone), which is in Kwango district. The target group was 15–49 year–old reproductive women who agreed to participate in the survey. The population of Kenge city is 309,468 and the study sample size was calculated using the Raosoft sample size calculator (http://samplesize.html) (95% confidence level, ±4% error range). The minimum sample size was determined to be 600. Twenty-three health areas, which were supported by the KOICA-MCH project, were surveyed. The sample was selected through probability proportionate to size (PPS) by dividing health areas into strata: those located within 5 km, 5–10 km, and more than 10 km from the health center. We randomly selected one village from each of the above strata. The number of households per village was selected in proportion to the population size of each stratum. The first household was randomly selected in the target area and the survey was completed according to the sample size of each area. In total, data were collected from 700 women. Data of 90 women were excluded due to error response and censoring. Finally, 610 women were selected for analysis in the study. This represents 1 % of the total population of reproductive age women (54,383) in Kenge city.

Study instrument

The questionnaire of the UNICEF Multiple Indicator Cluster Survey 2011(MICS 2011) was modified to identify the maternal and child health issues. In order to ensure that the questionnaire was valid and reliable, the final version of the questionnaire was decided through three meetings with three experts from the School of Public Health, UNIKIN, DRC. Thereafter, the questionnaire was validated by conducting a pre-survey in 36 women in Maluku city near with Kinshasa, which is similar to Kenge city. The result of the reliability analysis of the five dimensions of the Euro Quality of Life 5 Dimension (EQ-5D) was .063 by Cronbach's α analysis. The EQ-5D consisted of 'Mobility', 'Self-Care', 'Usual Activities', 'Pain/Discomfort', and 'Anxiety/Depression'.

Dependent variables

The dependent variable was health problems experienced by reproductive women within 42 days after childbirth (postpartum period). Postpartum health problems were evaluated by direct face-to-face interviews. The health problems comprised of malaria, bleeding and high fever, backache, and hypertension due to infection. If respondents experienced any of the postpartum health problems, it was coded as "1", otherwise it was coded as "0". In the case of simple answers such as "I was sick" and "I felt ill," these were excluded. Only respondents who received a diagnosis at a health facility were categorized as having postpartum problems.

Independent variables

The independent variables in this study consisted of three characteristics: Demographic and socioeconomic characteristics, reproductive health characteristics and health service utilization, and MCH intervention characteristics.

Demographic and socioeconomic characteristics consisted of 10 variables: age, monthly household income, monthly health expenditure, educational level, occupation, reading skill, writing skill, calculation skill[34, 35]. In addition, self-quality of life and EQ-5D were included in the demographic and socioeconomic characteristics because mental health after childbirth influences postpartum health problems[36].

Reproductive health characteristics and health service utilization consisted of number of pregnancies, number of childbirths, stillbirths experienced, abortions experienced, PNC by a health professional, PNC experience, first prenatal period, number of PNC visits, unintended pregnancy, breast feeding immediately after childbirth, delivery by health professional, physical examination immediately after childbirth, PNC within 24 hours, 7 days, 14 days, and 42 days[37].

The ***MCH intervention characteristics*** consisted of awareness of MCH interventions, RECO (Relais comunautaire) activity recognition, RECO activity experience, completed education on RECO which included PCIME (Prise en Charge Integree des Maladies de l'Enfant), SMNE (Projet d'Equipement des Structures Sanitaires), antenatal care (ANC), postnatal care (PNC), nutrition, hand washing, immunization, and malaria.

Data collection and statistical analysis

The data were collected by home visits. Face-to-face interviews were conducted with married women of reproductive age. The data were collected by four survey teams. Each survey team consisted of a team manager, a supervisor to ensure accuracy, and two enumerators. The survey took approximately one hour per respondent. The analysis was done in three phases: first, we calculated the proportion of postpartum health problems among participating women. Second, the t-test and chi-square test were applied to assess the statistical significance of the associations between the dependent variables and independent variables. Third, binary logistic regression analysis was conducted to assess the risk factors of postpartum health problems among married women of reproductive age. All analyses were performed using SPSS version 24.0.

Results

Postpartum health problems

Table 1 shows the frequency of postpartum health problems among participating women. Among 597 women, 385 (64.5%) had experienced health problems during the postpartum period. More than half (56.1%) of women had fever, followed by

Table 1: Postpartum health problems among married women of reproductive age in Kenge City, DRC

Health Problem	N	%
Yes	212	35.5%
Fever	119	56.1%
Malaria	38	17.9%
Bleeding	30	14.2%
Other	25	11.8%
No	385	64.5%
Total	597	100.0%

malaria (9.9%), bleeding (7.8%) and other health problems (11.8%). Other postpartum health problems were body aches, dizziness, vomiting and lethargy.

Demographic and socioeconomic characteristics

Table 2 shows the result of paired t-test and chi-square test to assess the statistical significance of differences in demographic and socioeconomic characteristics on postpartum health problems. There was a significant difference in postpartum health problems between those with different educational levels (χ^2=9.9658, p=.0007). Similarly, there were significant differences in postpartum health problems between those with and without reading skills (χ^2=19.2184, p<.0001) and those with and without writing skills (χ^2=9.9658, p<.0001).

Reproductive health and health service utilization characteristics

Table 3 shows the results of paired t-test and chi-square test to assess the statistical significance of difference in reproductive health and health service utilization characteristics on postpartum health problems. There was a significant difference in postpartum health problems between those who had a good prenatal care experience in reproductive health and health service utilization characteristics compared to those who did not (χ^2=7.0808, p=.0078). There was a significant difference in postpartum health problems between those who had a physical examination immediately after birth compared to those who did not (χ^2=36.0826, p<.0001). Furthermore, there were strong statistically significant differences in postpartum health problems between those who

Table 2: Demographic and Socio-Economic Characteristics among married women of reproductive age in Kenge City, DRC (n=597)

	Total		Postpartum Health Problem		t/χ^2	P
	n	%	No (n=385, 64.5%)	Yes (n=212, 35.5%)		
Age (Average)			29.70	29.53	.27	.7891
Income (Average)			50,033 FC*	54,997 FC*	-.51	.6147
Health Expenditure			16,956 FC	15,906 FC	.41	.6842
Occupation						
Professional	91	17.9	49(53.8%)	42(46.2%)		
Clerical	48	9.5	33(68.8%)	15(31.3%)	6.7137	.0816
Sales and Service	51	10.1	27(52.9%)	24(47.1%)		
Manual and Housework	314	62.5	205(65.3%)	109(57.4%)		
Educational level						
≤Primary	40	12.4	30(75.0%)	10(25.0%)		
≤Secondary	422	72.9	259(61.4%)	163(38.6%)	9.9658	.0007
≤Higher	85	14.7	56(65.9%)	29(34.1%)		
Life Satisfaction						
EQ-5D**			.9783	.9745	.86	.3904
Quality of Life***			58.2	60.0	-1.32	.1862
Reading Skill						
No	200	33.4	153(76.5)	47(23.5)	19.2184	<.0001
Yes	393	66.6	299(64.6)	164(35.4)		
Writing Skills						
No	206	34.4	158(76.7%)	48(23.3%)	20.7696	<.0001
Yes	387	65.6	224(57.9%)	163(42.1%)		
Calculation Skills						
No	101	20.1	73(72.3%)	28(27.7%)	3.3788	.0660
Yes	490	79.9	307(62.7%)	183(37.3%)		

*FC: Democratic Republic of the Congo Monetary Unit
** EQ-5D: Euro Quality of Life Dimension 5; Score range was 0 to 1.
*** Quality of Life was measured using the visual analogue scale (VAS), and the score range was 0 to 100.

Table 3: Reproductive health and health service utilization characteristic among married women of reproductive age in Kenge City, DRC (n=597)

Characteristic	Total		Postpartum Health Problem		t/χ^2	P
	n	%	No (n=385, 64.5%)	Yes (n=212, 35.5%)		
Number of pregnancies (average)			3.7363	3.6462	.48	.6284
Number of childbirths (average)			3.9321	3.8626	.36	.7210
Abortions experienced						
No	536	90.1	343(64.0%)	193(36.0%)	.3353	.5625
Yes	59	88.3	40(67.8%)	19(32.2%)		
Prenatal care by health professional						
No	70	11.7	52(74.3%)	18(25.7%)	3.3233	.0683
Yes	527	88.3	333(63.2%)	194(36.8%)		
Prenatal care experience						
No	11	1.9	10(90.9%)	1(9.1%)	3.4287	.0641
Yes	585	98.1	374(63.9%)	211(36.1%)		
First prenatal visit						
Less than 3 months	131	22.3	79(60.3%)	52(39.7%)		
4 to 6 months	209	35.7	138(66.0%)	71(34.0%)	1.3238	.7235
More than 7 months	20	3.4	12(60.0%)	8(40.0%)		
Don't know	226	38.6	146(64.6%)	80(35.4%)		
Number of prenatal care visits						
< 4 time	147	25.1	93(24.4%)	54(26.5%)	.3000	.5839
≥ 4 time	438	74.9	288(75.6%)	150(73.5%)		

Unintended pregnancy						
No	147	25.1	93(63.3%)	54(36.7%)	.3000	.5839
Yes	438	74.9	288(65.8%)	150(34.2%)		
Breast feeding immediately after birth						
No	98	16.7	65(66.3%)	33(33.7%)	.1594	.6897
Yes	489	83.3	314(64.2%)	175(35.8%)		
Delivery by health professional						
No	34	5.7	24(70.6%)	10(29.4%)	.5856	.4441
Yes	563	94.3	361(64.1%)	202(35.9%)		
Physical examination immediately after birth						
No	163	27.7	137(84.0%)	26(16.0%)	36.0826	<.0001
Yes	425	72.3	245(57.6%)	180(42.4%)		
Postnatal care within 24 hours						
No	228	51.1	98(43.0%)	130(57.0%)	38.3728	<.0001
Yes	218	48.9	157(72.0%)	61(28.0%)		
Postnatal care within 7 days						
No	326	73.1	172(52.8%)	154(47.2%)	9.6419	.0019
Yes	120	26.9	83(69.2%)	37(30.8%)		
Postnatal care within 14 days						
No	359	80.5	193(53.8%)	166(46.2%)	8.7629	.0031
Yes	87	19.5	62(73.3%)	25(28.7%)		
Postnatal care within 42 days						
No	192	43.1	145(75.5%)	47(24.5%)	46.3424	<.0001
Yes	254	56.9	110(43.3%)	144(56.7%)		

received attention in the postnatal care period compared to those did not: within 24 hours (χ^2=38.3728, *p*<.0001), 7 days (χ^2=9.6419, *p*=.0019), 14 days (χ^2=8.7629, *p*=.0031), 42 days (χ^2=46.3424, *p*<.0001).

MCH intervention characteristics

Table 4 shows the results of chi-square test to assess the statistical significance of differences in postpartum health problems due to differences in MCH intervention characteristics. There were significant differences in postpartum health problems and differences in PCIME (χ^2=24.1676, *p*<.0001), prenatal care (χ^2=40.6830, *p*<.0001), hand washing (χ^2=36.6368, *p*<.0001), immunization (χ^2=36.0826, *p*<.0001), and malaria (χ^2=21.5148, *p*<.0001) of completed RECO education.

Risk factors of postpartum health problems

To identify the risk factors of health problems during the postpartum period, this study performed binary logistic regression using variables that were significant in the paired t-test and chi-square test (Table 5). Binary logistic regression was conducted using the input analysis. The result of Hosmer-Lemeshow goodness of fit test for logistic regression, which was the appropriate fit model, was (χ^2=15.089, df=8, p=.057). Furthermore, the Cox & Senll R^2 was .264 and Nagelkerke R^2 value was .353. Therefore, the explanatory power of the dependent variable was 26 to 35% in model.

In the result of the logistic model, the significant factors were postnatal care within 24 hours; 7 days; 14 days in the reproductive health and health service utilization characteristics. Women who did not receive the first postnatal care within 24 hours after childbirth were 2.1-fold more likely to experience health problems during the postpartum period (OR=2.197, 95% CI: [1.15–4.17], p=.016). Moreover, women who did not receive the first postnatal care within 7 days after childbirth were 1.9-fold more likely to experience health problems (OR=1.972, CI: [1.10–3.52], p=.022). Similarly, women who did not receive the first postnatal care within 14 days after childbirth were 2.1-fold more likely to experience health problems (OR=2.124, 95% CI: [1.08–4.17], p=.029) during the postpartum period.

With respect to MCH intervention characteristics, women who did not complete the PCIME education by RECO were 1.8-fold more likely to experience health problems (OR=1.845, 95% CI:

Table 4: Maternal and Child Health intervention characteristics among married women of reproductive age in Kenge City, DRC

	Total		Postpartum Health Problem		t/χ^2	*P*
	n	%	No (n=385, 64.5%)	Yes (n=212, 35.5%)		
Awareness of MCH intervention						
No	60	10.1	45(75.0%)	15(25.0%)	3.1994	.0737
Yes	532	89.9	337(63.3%)	195(36.7%)		
RECO activity recognition						
No	25	4.2	20(80.0%)	5(20.0%)	2.7690	.0961
Yes	565	95.8	360(63.7%)	205(36.3%)		
RECO activity experience						
No	47	8.3	33(70.2%)	14(29.8%)	.8829	.3474
Yes	521	91.7	330(63.3%)	191(36.7%)		
Completed RECO education (PCIME)						
No	165	31.3	81(49.1%)	84(50.9%)	24.1676	<.0001
Yes	362	68.7	252(69.6%)	110(30.4%)		
Completed RECO education (SMNE)						
No	131	24.9	88(67.2%)	43(32.8%)	4.5338	.1036
Yes	396	75.1	245(61.9%)	151(38.1%)		
Completed RECO education (Prenatal care)						
No	207	39.4	98(47.3%)	109(52.7%)	40.6830	<.0001
Yes	319	60.6	235(73.7%)	84(26.3%)		
Completed RECO education (Postnatal care)						
No	47	8.9	34(72.3%)	13(27.7%)	4.5330	.1037
Yes	479	91.1	299(62.4%)	180(37.6%)		
Completed RECO education (Nutrition)						
No	109	20.7	71(65.1%)	38(34.9%)	3.5514	.1694
Yes	418	79.3	262(62.7%)	156(37.3%)		
Completed RECO education (Hand washing)						
No	330	62.7	178(53.9%)	152(46.1%)	36.6368	<.0001
Yes	196	37.3	155(79.1%)	41(20.9%)		
Completed RECO education (Immunization)						
No	209	39.8	106(50.7%)	103(49.3%)	26.7437	<.0001
Yes	316	60.2	226(71.5%)	90(28.5%)		
Completed RECO education (Malaria)						
No	301	57.2	167(55.5%)	134(44.5%)	21.5148	<.0001
Yes	225	42.8	166(73.8%)	59(26.2%)		

MCH: Maternal and Child Health
RECO: Relais comunautaire; PCIME: Prise en Charge Integree des Maladies de l'Enfant; SMNE: Projet d'Equipement des Structures Sanitaires

[1.03–3.28], p=.037). In addition, women did not complete the hand washing education by RECO were 1.8 more likely to experience health problems (OR=1.897, 95% CI: [1.06–3.39], p=.031). Women who did not complete the malaria education by RECO were 2.0-fold more likely to experience the health problems during postpartum period (OR=2.003, CI: [1.19–3.36], p=.009).

Discussion

This study found that demographic and socioeconomic characteristics, reproductive health and health service utilization characteristics and MCH intervention characteristics were significant risk factors of health problems during the postpartum period, supporting previous studies on related factors of postpartum health[16-32].

According to results of previous studies, women who completed higher educational levels were more likely to utilize postnatal care after delivery[38]. However, the result of this study logistic regression model was no significant between women's education level and postpartum health. In this study, 72.9% of respondents completed secondary education and 14.7% of respondents

Table 5: Factors associated with postpartum health problems among married women of reproductive age in Kenge City, DRC

Independent variable		OR	95% CI	P-value
Education level	Preschool	1.000		
	Primary	1.064	[.21-5.25]	.939
	Secondary	1.431	[.42-4.84]	.564
	Higher	1.227	[.30-5.01]	.776
Reading skills	Yes	1.000		
	No	5.349	[.43-66.30]	.192
Writing skills	Yes	1.000		
	No	.105	[.01-1.26]	.076
Number of prenatal care	≥ 4	1.000		
	< 4	.625	[.37-1.05]	.075
Physical examination after immediately birth	Yes	1.00		
	No	.524	[.11-2.51]	.524
Postnatal care within 24 hours	Yes	1.000		
	No	2.197	[1.15-4.17]	.016
Postnatal care within 7 days	Yes	1.000		
	No	1.972	[1.10-3.52]	.022
Postnatal care within 14 days	Yes	1.000		
	No	2.124	[1.08-4.17]	.029
Postnatal care within 24 days	Yes	1.000		
	No	.577	[.31-1.05]	.442
Water source	Improved source	1.000		
	Un-improve source	.815	[.48-1.37]	.815
Completed education of RECO (PCIME)	Yes	1.000		
	No	1.845	[1.03-3.28]	.037
Completed education of RECO (Prenatal care)	Yes	1.000		
	No	1.664	[.91-3.03]	.096
Completed education of RECO (Hand washing)	Yes	1.000		
	No	1.897	[1.06-3.39]	.031
Completed education of RECO (Immunization)	Yes	1.000		
	No	.860	[.48-1.51]	.603
Completed education of RECO (Malaria)	Yes	1.000		
	No	2.003	[1.19-3.36]	.009

RECO: Relais comunautaire; PCIME: Prise en Charge Integree des Maladies de l'Enfant

completed more than higher education under the demographic and socioeconomic characteristics of this study. This result of educational level was in contrast with the result of the Demographic and Health Survey 2013-2014 in the DRC, which indicated that 44% of the 15–49-year-old women completed secondary education and 4% of 15–49 year-old women completed more than a higher education level[39]. It means that the educational level in Kenge city was higher than the national average in the DRC. The reason for this result is that Kenge city has high accessibility to health information and health knowledge, because it is located close to the capital city compared to other cities[40]. Therefore, educational level was not a significant variable because the average educational level of reproductive women in Kenge city is generally high. There is a need for future

studies to determine whether the presence of special educational institutions affects the educational levels in different cities in the DRC.

The significant risk factor according to the logistic model was postnatal care period after childbirth. The DHS reported that 48% of women received postnatal care within 42 days of delivery[39]. In addition, a previous study showed that 34.8% of women received postnatal care within 42 days of delivery[25]. This study showed a percentage in-between the DHS and the previous study, in that 43.1% of women received postnatal care within 42 days of delivery. Previous studies have shown that 80.6% of women received postpartum care from 14 to 42 days after childbirth in the DRC[25]. However, postpartum health problems in women who did not receive the first postnatal care were 2.197 times (within 24 hours),

1.972 times (within 7 days), 2.124 times (within 14 days) more likely to experience health problems. This study showed that postnatal care within 14 days after delivery is effective to reduce health problems during the postnatal period. Although it is difficult to determine the complete recovery time of postpartum mothers after delivery, the findings of this study are consistent with that of previous studies that postnatal care as soon as possible is helpful for complete recovery after delivery[41]. At the community level, the quality of care may also be preventing women from attending postnatal care[42]. Therefore, it is necessary to develop institutional support such as health education programs in the DRC so that reproductive women will be able to receive postnatal care within 14 days after childbirth.

In a previous study, it was shown that if women had a self-care knowledge of health after delivery then they can easily solve and prevent health problems during the postpartum period[43] Moreover, this study found that women who did not complete the health education by RECO were more likely to experience postpartum health problems. The risk factors of postpartum health problems regarding health education by RECO in the MCH intervention were PCIME, prenatal care, hand washing and malaria. The main tasks of RECO in the DRC were to improve accessibility to health facilities through provision of health support such as health education and home visits[44]. However, there is lack of RECO community health workers because incentives for health program activities in the DRC were too small and too late. Even the number of RECO in DRC is very low. Some RECO staff lack technical competency and do not have a high-level qualification. Therefore, this makes it difficult to achieve health goals[40]. This lack of number, technical competency, and low motivation of RECO may be the reasons for the low utilization of postnatal care by women and low health self-care knowledge. Therefore, it is necessary to develop a health education program for reproductive women. Furthermore, it is necessary to increase the number of RECO and to improve the RECO incentive system, such as transportation and overtime fees.

In this study, no significant differences were found between prenatal care and postpartum health problems. However, previous studies have shown that women who did receive prenatal care were 3 times (95% CI: [1.3–8.5]) more likely to receive the postnatal care service within 7 days. Moreover, women who did receive prenatal care were 2.5 times (95% CI: [1.4–4.5]) and 2.4 times (95% CI: [1.5–3.7]) more likely to receive postnatal care service within 28 days and 42 days, respectively[25]. Therefore, although prenatal care was not associated with postpartum health problems as a direct effect in this study, future research is needed to determine whether prenatal care is associated with the postpartum health problem as an indirect effect or mediating effect.

The Sereen's study reported an approach that prioritizes practical, measurable interventions designed to further reduce the maternal mortality, which is due to the '3 Delay Model'[1]. The '3 Delay Model' is comprised of 1) Delay the decision to seek care; 2) Delay arrival at a health facility; and 3) Delay the provision of adequate care[45]. In this study, 'Delay 1' had effective factors such as postnatal care period and health education related to postpartum health problems. To reduce the postpartum health problems after delivery by reproductive women in the DRC, it is necessary to develop and promote the health policy, health education program and intervention by focusing on 'Delay the decision to seek care' in the 3 Delay Model.

This study conducted the analysis by using the primary data. However, this study has limitation in continuously measuring the exposures and indicators of the effect factors associated with the postpartum health problems because this study used the cross-sectional design. In the future, it is necessary to study the factors associated with postpartum health problems through continuously measuring the exposures such as cohort study design.

Furthermore, this study was based on self-reported outcomes by face-to-face interviews to identify risk factors of postpartum health problems. Therefore, this study may differ from actual behavior. In the future, studies will improve the accuracy of the study by conducting a double check analysis using secondary data such as medical reports of health facilities. Previous studies used various dependent variables such as

the severity of physical symptoms, the number of health facility visits and the dates of illnesses to identify the effect factors of postpartum health problems[46,47]. However, this study used self-reported data as dependent variables to identify the postpartum health problems. Future studies should aim to analyze the number of health facility visits, the types of illnesses, the number of treatments, etc. to identify factors associated with postpartum health problems.

Conclusion

This study aimed to identify factors associated with health problems during the postpartum period among married women of reproductive age in the DRC. First, the study revealed that late first postnatal care after delivery had the highest probability of health problems during the postpartum period. Thus, it is necessary to develop and implement a health program so that women would be able to receive postnatal care within 14 days after delivery. Second, health education by RECO among MCH interventions has been shown to have an impact on the improvement of postpartum health problems. Therefore, health education programs by RECO will be an effective intervention to reduce postpartum health problems in the DRC.

Third, health problems during the postpartum period were also related to the time of receiving first PNC, participation in health education focusing on PCIME, hand-washing, and malaria. In particular, women who received the PNC services within 24 hours were healthier than women who received the PNC services later.

Ethical Approval

This study was approved by the Yonsei University Wonju Institutional Review Board (no. 1041849-201406-BM-027-03) in Korea and the Kinshasa University Bioethics Review Board (no. ESP/CE/057/2016) in the DRC. Informed consent was obtained from each respondent before information was collected.

Acknowledgements

Contribution of Authors

HC Lee and EW Nam designed the study. And HC Lee, AY So, P Mansiangi and EW Nam developed the research tool. P Mansiangi participated in the data collection. HC Lee and EW Nam supervised the data collection. HC Lee analysed data and prepared the manuscripts. HC Lee conducted the primary data analysis and prepared the manuscript. AY So advised on the analysis results and prepared the manuscript. EW Nam advised on all the processes of the article's development from design to submission. All of the authors approved the final draft for submission and the revised draft.

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