

ANTENATAL CARE AMONG ETHNIC POPULATIONS IN LOUANG NAMTHA PROVINCE, LAO PDR

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Abstract. One in 33 women in Lao PDR dies due to pregnancy-related causes, which is the highest in Southeast Asia. This study assessed ANC utilization rates and the determinants for these rates; it also explored rural maternal decision-making regarding the place of delivery and immunizations for their children under age five years. A cross-sectional study was carried out in Viengphukha District, Louang Namtha Province, Lao PDR in January 2008. Of 1,005 household representatives, 620 who had children age under five years were interviewed using a semi-structured questionnaire. Nearly one-quarter of mothers (23.4%) had at least one ANC visit during their most recent pregnancy, of which 4.5% had ≥ 4 ANC visits. ANC visit rates among lowland and midland mothers were 3.6 and 7.6 times higher than highland mothers, respectively ($p < 0.005$ and $p < 0.001$). Mothers with no ANC were more likely to deliver at home (adjusted OR=18.0; $p < 0.0001$). Home deliveries were more common among highland than lowland mothers (adjusted OR=10.5; $p < 0.05$). Children born to mothers who had no ANC visit were more likely to not complete routine immunization than those who were born to mothers who had ANC visits (adjusted OR=1.9; $p < 0.01$). Low ANC utilization rates in Lao PDR were observed among ethnic minority mothers who were less educated. ANC visits enhanced hospital deliveries and child immunizations. The promotion of ANC among women in remote rural communities is needed.

Key words: mother and child health, antenatal care, home delivery, immunization, Lao PDR

INTRODUCTION

Maternal health is a major public health concern in Lao PDR. According to

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the World Health Organization (WHO) in 2005, 1 in 33 women in Lao PDR died due to pregnancy-related causes. The maternal mortality ratio (MMR) in Lao PDR was 660 per 100,000 live births, which was the third highest in the Asia-Pacific region (WHO UNICEF, UNFPA, WB, 2007). The government of Lao PDR, in collaboration with the United Nations (UN), developed a millennium development goal (MDGs) to reduce the MMR to 185 per 100,000 live births by

2015. Antenatal care (ANC) is a major healthcare strategy to achieve the MDG (Lao PDR and UN, 2004).

In Lao PDR, ANC is provided free of charge at all healthcare levels. Women in urban areas are likely to utilize the provincial hospitals, central hospitals or private clinics for ANC, while women in rural areas tend to rely on health centers and district hospitals. The Ministry of Health, in collaboration with the United Nations Population Fund (UNFPA), recommended at least four ANC visits per pregnancy (UNFPA, 2003) in an attempt to decrease maternal mortality, by screening for sexual transmitted diseases and educating pregnant women regarding maternal and child health (MCH).

In our previous study conducted in semi-urban areas of Xiengkhuang Province, Lao PDR, the rate of at least one ANC visit was 63% (Phathamavong *et al*, 2008); however, 85% of the population live in rural areas. The WHO reported Lao PDR has the lowest rate of mothers receiving at least one ANC visit (23%) in Southeast Asia. Rates in the other countries in the region include 89% in Indonesia, 86% in the Philippines and Thailand, 76% in Myanmar, 68% in Vietnam and 38% in Cambodia (WHO and UNICEF, 2003). The United Nations Children's Fund (UNICEF) estimates 15% of all pregnancies will develop serious complications which need emergency care (UNICEF, 1999). In Lao PDR, 83% of deliveries took place at home (NSC, 2005); highlighting the potential vulnerability of Laotian to developing disability and death, should an emergency occur during the peripartum period.

Numerous studies in developing countries indicate factors affecting ANC utilization (Magadi *et al*, 2000; Nielsen *et al*, 2001; Adamu and Salihu, 2002; Pallikadavath *et al*, 2004; Fujita *et al*, 2005;

van Eijk *et al*, 2006; Thuy Trinh *et al*, 2007). In their systematic review, Simkhada *et al* (2000) showed that socio-demographic factors, availability, accessibility, affordability, health insurance, women's status in the household, women's knowledge, attitudes, beliefs and culture affected ANC utilization in developing countries.

The contribution of ANC to the reduction of maternal mortality was found to be limited in some studies because the prediction of complications threatening the mother's life was low (Campbell and Graham, 2006). This may be true in countries with low MMR and high ANC coverage. However, a study in Surabaya, Indonesia (Taguchi *et al*, 2003), found an association between maternal mortality and the number and onset of ANC visits. Many studies have demonstrated the benefits of ANC on the birth weight of newborn babies (Fujita *et al*, 2005), hospital deliveries and delivery by a skilled birth attendant (Islam *et al*, 2006; van Eijk *et al*, 2006; Yanagisawa *et al*, 2006; Mpembeni *et al*, 2007), postpartum care (Chakaraborty *et al*, 2002; Vintzileos *et al*, 2002; Dhakal *et al*, 2007), TT vaccination in women (Roper *et al*, 2007), childhood immunization (Matthews and Diamond, 1997; De and Bhattacharya, 2002) and breastfeeding practices (Mattar *et al*, 2007).

National surveys have noted low ANC utilization rates in Lao PDR; there are no published reports of the factors that determine these low rates. This study assessed ANC utilization rates, its determinants, and further explored the rural mother's decision-making regarding the place of delivery and immunization status of children under age five years.

MATERIALS AND METHODS

Study design and study site

A community based, cross-sectional

survey was carried out in Viengphukha District, Louang Namtha Province, Lao PDR (Fig 1) in January 2008. According to the National Growth and Poverty Eradication Strategy, Louang Namtha is among the poorest provinces in Lao PDR. It has five districts amongst which Viengphukha District was selected for this study. It is a typical district with a population of 19,996, particularly noted for its lack of electricity. It has 46 villages and is inhabited by 11 minor ethnic groups. There are three major ethnic groups in Lao PDR. Lowland Lao (Lao Lum) are the majority, and live in flat, river bank areas and are Buddhist. Midland Lao (Lao Therng) are mostly of the Khmou ethnic group; they live in mountainous areas and are animist. Highland Lao (Lao Sung) are of the Hmong ethnic group and live in mountainous areas and are also animist.

Sampling

There are nine health centers serving the population of Viengphukha District. We used simple random sampling to select five health centers. These centers serve 21 catchment villages. Based on time and accessibility, we selected 16 villages for data collection. In those villages, visits were paid to each household. There were 1,213 households, of which 1,005 (82.8%) were able to be contacted. The majority of those who could not be contacted (*ie*, 206) were not available at the time of the interview, and two refused to participate. Based on inclusion criteria of the family having a child under age five years, we finally enrolled and interviewed 620 households.

Data collection

We visited each household and had face-to-face interviews using a semi-structured questionnaire. In each household the mothers were interviewed. For quality control, interviewers received one-day-



Fig 1—Map of Lao PDR showing Louang Namtha Province.

training course from the chief researcher on the research protocol and questionnaire administration.

We developed the questionnaire based on the national guidelines on mother and child health care for health providers and the multi-country evaluation of the Integrated Management of Childhood Illness. To improve content validity, the questionnaire was first translated into English to obtain expert input, then later retranslated into Lao, then back translated to English with the help of a native speaker, to check for clarity and consistency. The questionnaire explored the socio-demographic characteristics of the participants and their households, experiences with MCH care, patterns of service utilization among mothers during the most recent pregnancy and the immunization status of their youngest child. ANC was defined as a pregnant woman that

visited a health center, district hospital or provincial hospital during her most recent pregnancy and received any kind of ANC by a medical doctor, midwife or nurse. The immunization status of the children was confirmed by the immunization card (yellow card), where possible. To improve the validity of the questionnaire we carried out a small pilot study.

Ethical considerations

Earlier, we obtained ethical approval from National Ethics Committee for Health Research, Ministry of Health, Lao PDR. Verbal informed consent was obtained from participants, after interviewers explained the research protocol and their rights.

Statistical analysis

Data analysis was done using SPSS statistic program version 13.0 for Windows. A chi-square test was performed to explore the determinants of ANC, delivery at a healthcare facility and full immunization of children under five years. A *p*-value of less than 0.05 was considered as statistically significant in our study. Statistically significant factors on bivariate analysis were included in the binary logistic regression analysis. The variables included in the logistic model for ANC were education level of the parents, yearly household income, ethnicity and existence of a health center in the village. Home delivery, incomplete immunization, education level of parents, yearly household income, ethnicity, existence of a health center in the village and an ANC visit at least once, were included on logistic regression analysis.

RESULTS

Socio-demographics

The majority of household represen-

tatives in this study were midland Lao (73.4%) and farmers (94.4%) (Table 1). The results indicate 46.3% of fathers had <2 years of education, and 58.0% of mothers had never attended school. The average number of children was 3.5 per mother. The average monthly household income was USD 5.

Utilization of health facilities

One hundred forty-five (23.4%) of 620 mothers with children under five had at least one ANC visit, of which 4.5% had at least four ANC visits during their most recent pregnancy (Table 2). The prevalence of home delivery was 90%, of which 4.8% were assisted by a skill birth attendant and 24.7% were assisted by a traditional birth attendant (TBA). Among children under five years, 25.2% received full immunizations.

Determinants of ANC visits

The results of chi-square test showed education levels of the parents were directly associated with ANC visits (Table 3) (OR=2.3; *p*<0.001; OR=2.9; *p*<0.001, respectively). ANC visits among mothers whose household income >USD 5 was 1.5 times higher than the others (OR=1.5; *p*<0.05). ANC visits among lowland and midland mothers were 19.7 and 6.0 times higher than highland mothers, respectively (OR=19.7; *p*<0.001 and OR=6.0; *p*<0.001, respectively). Mothers living in a village with a health center were more likely to get ANC at least one time more than mothers living in a village without a health center (OR=2.5; *p*<0.001).

Significant variables on bivariate analysis were used for regression analysis, and summary of the model indicated fitness (-2Log likelihood = 474.173; Cox & Snell *R* square = 0.100; Nagelkerke *R* square = 0.148; overall predicted power = 75.8%). Among all variables, ethnicity remained a

Table 1
Socio-demographic characteristics of participants.

		N = 1005	%
Ethnicity	Lowland Lao	104	10.3
	Midland Lao	738	73.4
	Highland Lao	163	16.2
Age (year)	Fathers (Mean (SD)) = 40.7 (11.9)		
	≤40	497	49.5
	>40	360	35.8
	Don't know age	148	14.7
	Mothers (Mean (SD)) = 37.2 (11.8)		
	≤37	501	49.9
	>37	410	40.8
Occupation of fathers	Government officer	31	3.1
	Labor	11	1.1
	Farmer	949	94.4
	Other	7	0.7
	Missing	7	0.7
Educational level (years)	Fathers [Median (IQR)] = 2.0 (0.0-5.0)		
	≤2	465	46.3
	>2	403	40.1
	Missing	137	13.6
	Mothers [Median (IQR)] = 0.0 (0.0-1.0)		
	=0	583	58.0
	>0	214	21.3
Number of children	Mean (SD) = 3.5 (2.3)		
	≤3	559	55.6
	>3	425	42.3
Household income/month (US Dollars)	Missing	21	2.1
	Median (IQR) = 5 (2-15)		
	≤ USD 5	523	52.0
	> USD 5	444	44.2
	Missing	38	3.8

statistically significant predictor for ANC: lowland and midland mothers were 3.9 and 7.2 times, respectively, to have ANC than highland mothers (adjusted OR=3.9; $p<0.01$ and adjusted OR=7.2; $p<0.01$, respectively). Mothers who had attended school were more likely to have had at least one ANC visit (adjusted OR=1.6; $p<0.05$).

Effect of ANC on hospital deliveries and child immunizations

Bivariate analysis showed home deliveries were less likely when the parents had higher education (OR=0.3; $p<0.001$ and OR=0.5; $p<0.05$, respectively). Mothers living in a village without a health center and having no ANC visits during the

Table 2
Antenatal care, place of delivery among mothers and child immunization.

		N=620	%
Antenatal care	Yes	145	23.4
	No	475	76.6
Number of ANC visits	Mean (SD) = 2.4 (1.4)		
	≥4 visits	28	4.5
Place of delivery	Hospital	52	8.4
	Home	558	90.0
	Missing	10	1.6
If "Home delivery", assisted by: (n=558)	SBA	27	4.8
	TBA	138	24.7
	Families	202	36.2
	Neighbor	21	3.8
	Self delivery	170	30.5
Family assisted delivery, assisted by: (n=202)	Grandmother	26	12.9
	Grandfather	1	0.5
	Mother	112	55.4
	Father	7	3.5
	Sister	17	8.4
	Husband	36	17.8
	Missing	3	1.5
Full immunization ^a	Yes	156	25.2
	No	444	71.6
	Don't know	8	1.3
	Missing	12	1.9

^aFull immunization, 1 BCG, 3 DPT, 3 Polio and 1 Measles; SBA, skilled birth attendant; TBA, traditional birth attendant

most recent pregnancy were more likely to have a home delivery (OR=3.2; $p<0.001$) (Table 4). Home deliveries were more common among highland (OR=30.6; $p<0.001$) and midland mothers (OR=6.9; $p<0.001$) than lowland mothers. On logistic regression analysis (model summary: -2 Log likelihood = 182.057; Cox & Snell R square = 0.151; Nagelkerke R square=0.349; overall predicted power=91.6%), only ANC visits remains significantly associated with home deliveries (adjusted OR=20.1; $p<0.001$).

Children whose mothers and fathers had a higher educational level (OR=0.6; $p<0.05$ and OR=0.6; $p<0.05$, respectively) and had a monthly income greater than USD 5 (OR=0.6; $p<0.01$) were less likely to have incomplete immunizations (Table 4). Incomplete immunizations were 4.5 times more common among highland children than lowland children (OR=4.5; $p<0.01$). Children whose mothers had no ANC during their most recent pregnancy were more likely to have incomplete immunizations than children whose mothers did have

Table 3
Factors influencing decision making of mothers with children aged less than 5 years regarding ANC for the most recent pregnancy.

	N ^a	≥1ANC visit			
		OR (95%CI)	p-value	AOR (95%CI)	p-value
Age of father (years)					
≤ 40	101/385	0.9 (0.6-1.4)	N.S	-	-
> 40	47/166	1		-	-
Age of mother (years)					
≤ 37	102/397	0.9 (0.6-1.4)	N.S	-	-
> 37	48/179	1		-	-
Education of father (years)					
≤ 2	49/281	1		1	
> 2	86/261	2.3 (1.6-3.4)	<0.0001	1.3 (0.8-2.1)	N.S
Education of mother (year)					
= 0	64/354	1		1	
> 0	58/149	2.9 (1.9-4.4)	<0.0001	1.6 (1.0-2.8)	0.041
Number of children					
≤ 3	82/337	1.2 (0.8-1.7)	N.S	-	-
> 3	60/275	1		-	-
Household income/month					
≤ USD 5	66/321	1		1	
> USD 5	78/280	1.5 (1.0-2.2)	0.027	1.2 (0.7-1.9)	N.S
Ethnicity					
Lowland Lao	24/56	19.7 (7.8-49.7)	<0.0001	3.9 (1.5-10.2)	0.006
Midland Lao	115/446	6.0 (2.7-13.3)	<0.0001	7.2 (2.1-25.4)	0.002
Highland Lao	6/111	1	-	1	-
Existence of health center in the village					
Yes	95/301	2.5 (1.7-3.7)	<0.0001	1.5 (0.9-2.5)	N.S
No	50/319	1		1	

All statistically significant variables on bivariate analysis, education of father and mother, household income, ethnicity and existence of health center, were included on logistic analysis. OR, Odds ratio; AOR, Adjusted odds ratio by binary logistic regression; N.S, not significant; ^aN does not equal 620 due to non-response to questions.

ANC (OR=2.4; $p<0.001$). On logistic analysis (model summary: Model: -2 Log likelihood=494.117; Cox & Snell R square=0.088; Nagelkerke R square=0.126; overall predicted power=72.3%), an association was only found between mothers who had no ANC and incomplete immunizations for children under five years old (adjusted OR=1.9; $p<0.01$).

DISCUSSION

This study had some limitations. First, since this was a cross-sectional study; a cause-effect relationship could not be established. Second, there is a chance of recall bias among mothers where they had to recall past events. Third, our sample had women who were predominantly poor and were less educated; hence the findings

Table 4
ANC visits influencing home delivery and incomplete immunizations.

	N ^b	Home delivery		Incomplete immunization ^e	
		OR (95%CI)	AOR (95%CI)	N ^f	OR (95%CI) AOR (95%CI)
Age of father (years)					
≤ 40	344/378	1	-	272/375	1 -
> 40	150/164	0.9 (0.5-1.8)	-	115/157	1.0 (0.6-1.4)
Age of mother (years)					
≤ 37	354/389	1	-	281/389	1 -
> 37	162/177	0.9 (0.5-1.8)	-	128/168	0.8 (0.5-1.2)
Education of father (years)					
≤ 2	261/277	1	1	209/272	1 1
> 2	225/255	0.5 (0.2-0.9) ^a	0.8 (0.3-1.9)	168/251	0.6 (0.4-0.9) ^a 1.0 (0.6-1.5)
Education of mother (years)					
= 0	333/352	1	1	258/343	1 1
> 0	120/143	0.3 (0.2-0.6) ^d	1.0 (0.4-2.3)	96/145	0.6 (0.4-1.0) ^a 1.1 (0.7-1.8)
Number of children					
≤ 3	297/329	0.7 (0.4-1.3)	-	250/328	1.2 (0.9-1.8)
> 3	253/272	1	-	189/264	1 -
Household income/month					
≤ USD 5	243/272	1	1	244/311	1 1
> USD 5	297/318	0.6 (0.3-1.1)	0.8 (0.3-1.7)	185/271	0.6 (0.4-0.9) ^b 0.7 (0.4-1.0)
Ethnicity					
Lowland	36/55	1	1	37/51	1 1
Midland	405/436	6.9 (3.5-13.4) ^d	2.9 (0.3-24.7)	299/432	0.9 (0.4-1.6)
Highland	116/118	30.6 (137.8) ^d	10.6 (0.9-124.2)	108/117	4.5 (1.8-11.4) ^b 3.4 (0.9-12.5)
Existence of health center in the village					
Yes	255/293	1	1	208/288	1 -
No	302/316	3.2 (1.7-6.1) ^d	0.8 (0.3-1.9)	236/312	1.2 (0.8-1.7)
≥1ANC visit					
Yes	118/161	1	1	92/152	1 1
No	439/448	17.8 (8.4-37.5) ^d	20.1 (7.3-55.0) ^d	352/448	2.4 (1.6-3.6) ^d 1.9 (1.2-3.0) ^b

χ^2 -test: ^a p<0.05; ^b p<0.01; ^c p<0.001; ^d p<0.0001; OR, Odds ratio; AOR, Adjusted odds ratio by binary logistic regression; ^e Failed to complete 1 BCG, 3 DPT, 3 Polio and 1 Measles was classified as incomplete immunization. ^f N was not equal 620 due to non-response to questions.

of our study should be extrapolated with caution.

We found 23% of mothers in rural areas received at least one ANC visit, which is consistent with a WHO report (23%) in 2003 (WHO and UNICEF, 2003). This rate (23%) was much lower than in our study of semi-urban areas of Xiengkhuang Province (63%) (Phathamavong *et al*, 2008), suggesting a gap in ANC utilization between women in urban and rural areas of Lao PDR.

The WHO recommends 4 ANC visits during each pregnancy to eliminate risks of pregnancy-related maternal deaths. Information regarding the 4 ANC visits is not available for Lao PDR. The WHO reported higher rates from other countries for mothers receiving 4 ANC visits: 21% in Bangladesh, 56% in India, 23% in Nepal, 53% in Pakistan, 77% in Indonesia and 69% in the Philippines (WHO and UNICEF, 2003). However, our data indicate only 4.5% of women had at least 4 ANC visits. Low ANC utilization and the high proportion of home deliveries (90%) suggest women in rural communities of Lao PDR remain highly vulnerable to pregnancy-related morbidity and mortality.

The association between ANC and education was found to be strong in Vietnam, India and Kenya (Nielsen *et al*, 2001; van Eijk *et al*, 2006; Thuy Trinh *et al*, 2007). Simkhada *et al* (2007), found results from many studies in Asia and Africa support this association. Our study shows even with low education levels in parents, there exists a weak positive association between education level among parents and ANC for the most recent pregnancy. The weak association in our study was probably due to much lower education levels in this population; where more than half of mothers had never attended school, and the

average number of years of education among husbands was only two years.

Another significant factor influencing ANC was ethnicity. Not surprisingly, ANC was less common among highland and midland mothers than lowland mothers. Among highland and midland people, utilization of ANC may be influenced by beliefs, culture and lifestyle. Studies from Ethiopia, India, Nigeria and Vietnam report similar findings (Simkhada *et al*, 2007; Thuy Trinh *et al*, 2007).

The availability of and access to healthcare facilities may be another determinant of ANC. Mothers needed to walk for one to two hours to reach the nearest healthcare facility, which discourage them from obtaining ANC. This finding is consistent with studies from Kenya (Magadi *et al*, 2000) and Tamil Nadu, southern India (Nielsen *et al*, 2001).

Having received no ANC was directly associated with home delivery, regardless of socio-demographic characteristics or availability of a healthcare facility. Studies from Bangladesh and Cambodia have consistently shown a direct association between regular ANC visits and delivery taking place at a healthcare facility among mothers in a rural community (Islam *et al*, 2006; Yanagisawa *et al*, 2006).

Children whose mothers had ANC were more likely to be fully immunized than children whose mothers had no ANC, regardless of socio-demographic characteristics, ethnicity or availability of a healthcare facility. In the study area, vaccines are provided free of charge through an outreach team 4 times a year; therefore, all children have an equal opportunity to receive full immunizations. A study in northern India also noted children were more likely to have immunizations if their mothers received ANC (De and

Bhattacharya, 2002). A study from Ghana found children whose mothers received ANC provided by doctors and/or nurses were more likely to receive full immunizations than those whose mothers received ANC provided by a traditional birth attendant or in those whose mothers received no ANC (Matthews *et al*, 1997).

One of the classic components of routine ANC in Lao PDR is health education of pregnant women. Our findings show that ANC is more likely to be obtained by women with a higher education; this was the most significant determinant of hospital delivery and child immunization. This suggests the vital effect of health education on health seeking behavior, particularly in reproductive age women. In this study we did not focus on maternal knowledge and its effect on their health seeking behavior, as it was beyond the scope of this study. Further study is needed to understand and demonstrate this mechanism.

In recent times, numerous maternal and child health care programs have been implemented in Lao PDR, funded by international and non-government organizations (NGOs). Many of them are based on the mechanism of results-based funding, so these programs focus mainly on activities that produce tangible, short term results that are easy to evaluate, such as coverage, prevalence of morbidity and mortality and evaluations. Unfortunately, despite its importance, health education is not a main priority with these organizations, since it is difficult to evaluate and provide evidence of behavior change with short term programs.

ANC has been prioritized as a major strategy to tackle the high maternal death rate in Lao PDR. This study revealed a low ANC utilization rate (23%) among ethnic minority mothers, who had less education.

Although the nature of the study does not allow us to comment on a causal relationship, the results do indicate an association between ANC and hospital deliveries and immunizations in their children.

The ministry of health, in collaboration with the United Nations Children's Fund (UNICEF) has been implementing "community-based" ANC, aiming at increasing its utilization rate among women in remote, rural areas. Although a well intentioned initiative, it is important to have an understanding of community-based versus facility based ANC. Further research may help provide information to assist in making rational decisions to improve this situation.

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