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Abstract

This study assessed the relationship between women's empowerment and the use of antenatal care (ANC) services in five Southeast Asian (ASEAN) countries. The data used in the study are from the most recent Demographic and Health Surveys (DHS) conducted in Cambodia (2014), Indonesia (2012), Myanmar (2016), the Philippines (2013), and Timor-Leste (2009).

The focus of the analysis was on currently married women who gave birth within the last 5 years before the survey. The two main outcomes were the number of ANC visits they made (four or more compared with none to three), and the timing of the first ANC visit (within the first trimester or later in the pregnancy). Four composite women's empowerment variables were created from 17 indicators: (1) labor force participation; (2) disagreement with reasons for wife beating; (3) decision-making power over household issues; and (4) knowledge level (based on education and media exposure). Analysis used logistic regression with adjustment for complex sampling design.

Overall, results differed among the five countries. Labor force participation was significantly associated with number of ANC visits in Cambodia, Philippines, and Timor-Leste. Disagreement with reasons for wife beating and women's knowledge level were each independently associated with number of ANC visits in Cambodia, Indonesia, and Myanmar. Women's decision-making power was associated with number of ANC visits in Cambodia and Indonesia.

The association of women's empowerment variables with timing of the first ANC visit was not as evident as the association with number of visits. Labor force participation was significantly associated with attending ANC in the first trimester in Cambodia and Philippines. Disagreement with reasons for wife beating was significantly associated with early ANC visit only in Timor-Leste. Women's knowledge level was associated with early first ANC visit only in Cambodia, and women's decision-making power was associated with early first ANC visit only in Philippines.

There was no difference between adult and adolescent mothers in the association between women's empowerment and use of ANC, except in two cases. In Cambodia, adolescent mothers with medium knowledge had lower odds of attending four or more ANC visits compared with adult mothers with poor knowledge; and in Myanmar, adolescent mothers with high labor force participation had higher odds of attending the first ANC visit early compared with the reference group of adult mothers with low labor force participation.

Keywords: Antenatal care, women's empowerment, labor force participation, decision-making power, women's disagreement toward wife beating, knowledge level.

1 Introduction

1.1 Background

Improving reproductive, maternal, neonatal, and child health (RMNCH) outcomes remains a challenge in most of the developing world, including Southeast Asia. Of six Southeast Asian (ASEAN) countries joining the Countdown to 2015¹, only two (Cambodia and Indonesia) achieved the MDG 4 target to reduce child mortality, and only two (Cambodia and Lao Republic) achieved the MDG 5 target to reduce maternal mortality (Victora et al. 2016). Extra effort will be needed to achieve the new child and maternal mortality targets established as Sustainable Development Goals (SDGs) for 2030. Today only Cambodia has the current reduction rate above 7.5% required to achieve the SDG target of maternal mortality (Alkema et al. 2016). To improve ability to achieve these targets, antenatal care (ANC) in the region must improve (UN-ESCAP, ADB, and UNDP 2014).

Inadequate ANC can threaten the life of newborns (Lincetto et al. 2006; Titaley et al. 2008). In Cambodia, the neonatal death rate among women who did not attend any ANC visits was more than six times as high as that of women who made four or more visits (Hong et al. 2017). The World Health Organization (WHO) recommends a minimum of four ANC visits as part of the global agenda (World Health Organization 2016b).

Women's empowerment should be considered an important element, as it corresponds with indicators of maternal health (Furuta and Salway 2006; Osamor and Grady 2016; Sado, Spaho, and Hotchkiss 2014; Yesudian 2009). A review of 67 studies in developing countries showed a positive association between women's empowerment and use of health services (Pratley 2016). A study using data from the most recent Demographic and Health Surveys (DHS) in 31 countries showed that women with the highest empowerment status were more likely to use modern contraception, attend four or more ANC visits, and have a skilled attendant at birth compared with women with lower empowerment status (Ahmed et al. 2010). An analysis of the 2007 Bangladesh DHS showed that women with high economic power and employment level, women with high disagreement with reasons to justify wife beating, women with decision-making power over familial health care and family planning, and women who had secondary or higher education had greater odds of attending at least four ANC visits (Haque et al. 2012). A study among Nepalese women found that a high level of autonomy was associated with more use of maternal health services (Adhikari 2016). Studies using DHS data from Indonesia and Timor-Leste found that women with little education were less likely to attend at least four ANC visits, although these

¹ Countdown to 2015 was a global agenda to achieve the targets of Millenium Development Goals (MDGs) for accelerating and ending preventable maternal, newborn, and child deaths.

studies did not examine other indicators of women's empowerment (Khanal et al. 2015; Titaley, Dibley, and Roberts 2010).

The decision-making power of adolescent mothers may differ from that of older mothers and thus may affect health-related decisions made by or for these adolescent mothers. In 2015, 5 of the 10 countries in ASEAN (Cambodia, Indonesia, Lao Republic, Philippines, and Thailand) reported an adolescent birth rate exceeding the global rate of 44.1 (Victora et al. 2016; World Health Organization 2016a). A study using data from the 2012 Indonesia Demographic and Health Survey (DHS) showed that 23% of teenage mothers reported their husbands or others made decisions for their health care (Utomo and Utomo 2013). In all ASEAN countries, the majority of people live in patriarchal systems (Niaz and Hassan 2006; Sue, Rasheed, and Rasheed 2015), and age determines social status. Adolescents are considered low in societal position, and this may impair their decision-making power.

There have been some improvements in Southeast Asia over the last 3 decades, both in women's education level and male-female power balance (Booth 2016), but women's poor social status, especially among adolescent mothers, may still have a negative impact on their use of health services. The preceding evidence suggests that the focus on women's empowerment among adolescent and adult mothers needs to be assessed to understand their potential contribution to improving RMNCH in ASEAN countries. Rightfully, the issues of women's empowerment and gender equality remain top priorities of the ASEAN governments (ASEAN 2016).

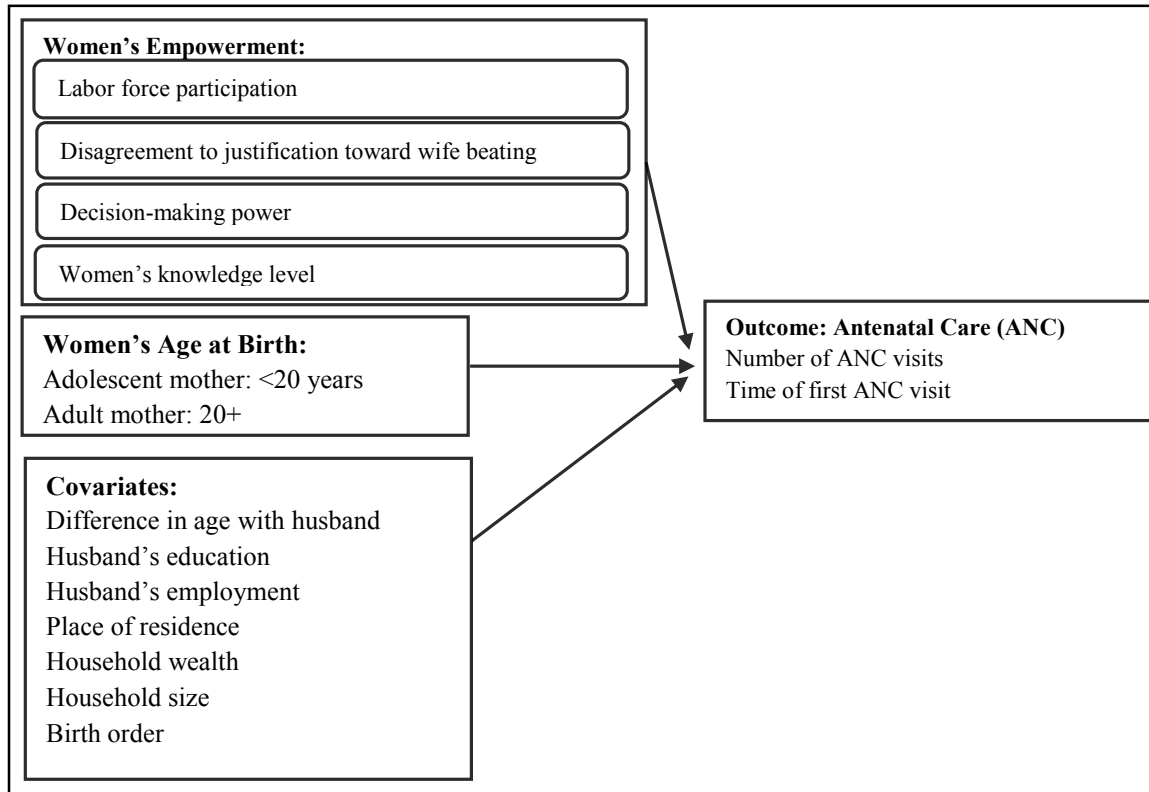
Too little attention, however, has been paid in ASEAN countries to finding evidence of the impact of women's empowerment on their reproductive health. Studies in the region on women's empowerment and its association with health care are limited. A recent study in four ASEAN countries suggested four components—labor force participation, household decision-making, family planning, and education—are important indicators for women's empowerment (Phan 2015). Our study modified this framework to investigate the association between women's empowerment and use of ANC in five ASEAN countries with recent DHS surveys: Cambodia, Indonesia, Myanmar, the Philippines, and Timor-Leste.

1.2 Conceptual Framework

To assess the association between women's empowerment and use of ANC, the analysis used two outcomes: the number of ANC visits and the timing of the first ANC visit. In our conceptual framework (Figure 1), we modified Phan's framework for women's empowerment (Phan 2015) and used four empowerment components as the variables of interest: women's labor force participation; women's disagreement with reasons to justify wife beating, women's decision-making power over household issues, and women's knowledge level. We adjusted for other covariates known to be correlated with ANC (Dahiru and Oche 2015; Khanal et al. 2015; Titaley, Dibley, and Roberts 2010). These covariates include age difference between the woman and her

husband, husband’s education, employment, and place of residence, household wealth, household size, and child’s birth order. We also adjusted for women’s age at birth and tested whether the association between ANC use and women’s empowerment differs between adolescent and adult mothers.

Figure 1. Conceptual framework of the association between women’s empowerment and antenatal care



1.3 Research Question

This study attempts to answer the following research questions:

1. Are there any associations between women’s empowerment variables and the use of ANC as measured by women’s number of ANC visits and by timing of the first ANC visit after pregnancy?
2. If yes, do the associations differ between adolescent and adult mothers?

2 Data and Methods

2.1 Data

Data from the latest Demographic Health Surveys (DHS) were used for analysis. DHS data were only available for five countries of the Southeast Asia region: Cambodia (2014), Indonesia (2012), Myanmar (2016), the Philippines (2013), and Timor-Leste (2009). Antenatal care (ANC) information for the most recent births of currently married women in the last 5 years preceding the survey were analyzed.

2.2 Key Variables and Measurements

Use of ANC was measured using two indicators: number of ANC visits and timing of the first ANC. Number of ANC visits was categorized into <4 visits or ≥ 4 visits (recommended number), and time of the first ANC was categorized into <4 months (recommended time of first ANC) and ≥ 4 months of gestation. Women's age at giving birth was categorized into adolescent birth ($<$ age 20) or non-adolescent birth (\geq age 20).

As mentioned, women's empowerment comprised four components, which were created from 17 indicators using principal component analysis. The 17 indicators were selected based on a published framework that categorized women's empowerment into labor force participation, decision-making, education, and knowledge of family planning. We excluded knowledge of family planning because it was reported to be unassociated with women's empowerment in Southeast Asian countries (Phan 2015), but we added women's disagreement with reasons to justify wife beating.

Figure 2 shows the 17 indicators used in the analysis, grouped into the four components. Labor force participation is indicated by six aspects: work in the last 12 months (work or not), for whom women works (not working, work for family members, work for someone else, self-employed), women's occupation (not working, unskilled labor, skilled labor, professional and self-employed), types of payment (not working, not paid, paid in cash and in-kind, paid in cash only), work all years (not working, work occasionally, work seasonally, work all year) and earn more than husband (not working or not paid in cash, earn less than husband, earn about the same as husband, earn more than husband).

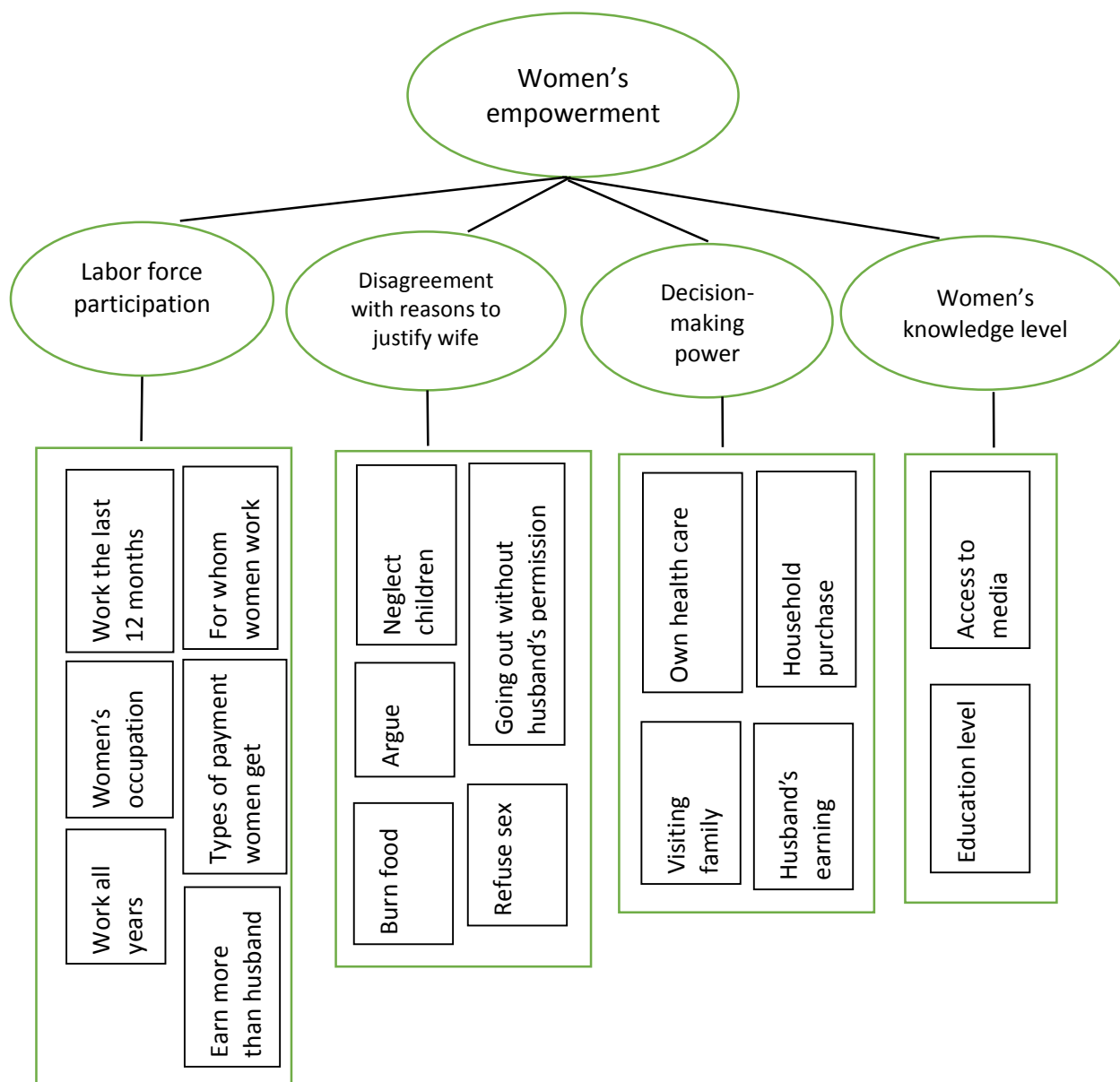
Women's disagreement with reasons to justify wife beating was assessed in five areas: neglecting children; going out without husband's permission; arguing with husband; refusing sex; and burning food.

Decision-making power was evaluated with questions on who made decisions about women's own health care, household purchases, visits to family members, and husband's earnings. All decision components were categorized into a decision made by husband or other person, a decision made

together with the woman, or a decision made by the woman only. The women's knowledge component included formal educational level (no education, primary, secondary, and higher) and access to media (no access, access to some media, and access to all types of media). Principal component analysis of the 17 variables resulted in four different components representing labor force participation, disagreement with reasons to justify wife beating, decision-making power, and knowledge level. Each component was then divided into terciles of low, medium, and high level. For disagreement with reasons to justify wife beating, women were categorized as having high disagreement if they disagreed with all five reasons for wife beating, and as having low disagreement if they disagreed with the smallest number of reasons for wife beating.

Other covariates included several variables, namely place of residence (rural-urban), household socioeconomic status (very poor, poor, middle income, rich, and very rich), household member (>4 or less), husband's education (no education, primary, secondary, and higher), husband's employment status (not working, agricultural labor, non-agricultural labor), age difference between husband and wife (wife older than husband, husband older by 0–4 years, husband older by 5-7 years, and husband older by >7 years), and birth order of the child (first, second, and third or more).

Figure 2. Indicators of women’s empowerment



2.3 Statistical Analysis

Analysis of the association between the four components of women’s empowerment and the ANC outcomes was conducted using multiple logistic regression and adjusting for DHS sampling design. Interactions between each component of women’s empowerment and her age at birth were tested. Interaction is considered to occur if the p-value of the interaction was <0.05. All analysis was conducted using STATA 14.

3 Results

After exclusion of never-married and formerly married women, women who gave birth more than 5 years preceding the survey, missing information on number of ANC visits and ANC timing, and missing covariates data, the weighted sample size ranged from 2,536 in Myanmar to 12,902 in Indonesia. The characteristics of women in the sample varied across the five countries. As Table 1 shows, the percentage of women who gave birth as adolescents was lowest in Timor-Leste (5.7%) and highest in Cambodia (10.1%). The percentage of women attending four or more ANC visits was highest in Indonesia and Philippines, at 92% and 88%, and lowest in Timor-Leste, at 64%. The percentage of women who went for the first ANC visit in the first trimester was highest in Indonesia and Cambodia, at 84% and 83% respectively, and lowest in Myanmar, at 47%.

Table 1. Weighted characteristics of currently married women who gave birth in the last 5 years preceding the survey in Cambodia, Indonesia, Myanmar, Philippines, and Timor-Leste

Variables	Cambodia 2014 (N=5,112)		Indonesia 2012 (N=12,902)		Myanmar 2015-2016 (N=2,536)		Philippines 2013 (N=4,336)		Timor-Leste 2009 (N=4,558)	
	N	%	N	%	N	%	N	%	N	%
Age at birth										
Adult (≥20 years)	4,597	89.9	11,783	91.3	2,382	93.9	3,923	90.5	4,299	94.3
Adolescent (<20 years)	514	10.1	1,119	8.7	153	6.1	413	9.5	259	5.7
Number of antenatal visits										
Fewer than four	1,035	20.3	1,066	8.3	793	31.3	527	12.2	1,649	36.2
Four or more	4,076	79.7	11,836	91.7	1,743	68.7	3,808	87.8	2,909	63.8
Time of 1st antenatal visit										
4 months of gestation or more	874	17.1	2,093	16.2	1,356	53.5	1,511	34.8	2,188	48.0
Less than 4 months of gestation	4,238	82.9	10,809	83.8	1,179	46.5	2,825	65.2	2,369	52.0
Husband's education										
Incomplete primary education/none	2,241	43.8	1,191	9.2	810	31.9	708	16.3	1,913	42.0
Complete primary or some secondary	2,179	42.6	6,124	47.5	1,437	56.7	1,140	26.3	2,372	52.0
Complete secondary or higher	692	13.5	5,587	43.3	289	11.4	2,487	57.4	273	6.0
Residence										
Urban	753	14.7	6,613	51.3	689	27.2	2,019	46.6	1,170	25.7
Rural	4,359	85.3	6,289	48.7	1,847	72.8	2,316	53.4	3,388	74.3
Household Member										
<4	665	13.0	2,075	16.1	352	13.9	404	9.3	164	3.6
≥4	4,447	87.0	10,828	83.9	2,184	86.1	3,932	90.7	4,394	96.4
Birth order										
First child	1,805	35.3	4,863	37.7	940	37.1	1,140	26.3	621	13.6
Second child	1,636	32.0	4,230	32.8	675	26.6	1,107	25.5	681	15.0
Third child or more	1,672	32.7	3,810	29.5	921	36.3	2,089	48.2	3,256	71.4
Husband's occupation										
Agricultural	2,428	47.5	2,657	20.6	614	24.2	1,230	28.4	2,474	54.3
Non-agricultural	2,684	52.5	10,245	79.4	1,921	75.8	3,106	71.6	2,084	45.7
Difference in age between man and woman										
Woman older than man	1,369	26.8	1,982	15.4	819	32.3	1,235	28.5	787	17.3
Husband 0-4 years older	2,170	42.5	5,185	40.2	975	38.4	1,672	38.6	1,656	36.3
Husband 5-7 years older	877	17.2	3,025	23.4	386	15.2	731	16.9	832	18.3
Husband >7 years older	695	13.6	2,710	21.0	356	14.1	697	16.1	1,282	28.1

Table 2 shows that in all five countries the proportion of women attending four or more ANC visits increased as household wealth increased. Similarly, the proportion of women attending the first ANC in the first trimester (< 4 months) improved as wealth improved, except in Myanmar, where the distribution was similar across wealth quintiles, especially across the middle and richer quintiles. The proportion of women attending fewer than four ANC visits decreased as women's participation in the workforce, women's disagreement with reasons to justify wife beating, and women's knowledge level increased, except in Timor-Leste, for disagreement with reasons to justify wife beating and women's knowledge level. In all five countries the proportion of women

attending the first ANC visit later than the first trimester was lower as the level of women's disagreement to reasons to justify wife beating was higher. A similar pattern was observed for labor force participation in Indonesia and the Philippines. Except for Myanmar and Philippines, the proportion of women attending fewer than four ANC visits and the proportion attending after the first trimester declined as household wealth increased. A similar pattern was observed for women's knowledge level in all countries except Timor-Leste.

3.1 Number of ANC visits

Table 3 shows that women's labor force participation was significantly associated with the number of ANC visits in Cambodia, Philippines, and Timor-Leste. In Cambodia women with high participation in the labor force had 32% greater odds of attending the recommended number of ANC visits (four or more) compared with women with low participation. In Philippines women with medium and high labor force participation had 33% and 36% higher odds respectively of attending the recommended number of ANC visits compared with women with low participation. In Timor-Leste women with high labor force participation had 65% higher odds of attending the recommended number of four or more ANC visits compared with women with poor labor participation.

Women's disagreement with reasons to justify wife beating was significantly associated with number of ANC visits in Cambodia, Indonesia, and Myanmar. In Cambodia and Indonesia women with medium disagreement with reasons to justify wife beating had 39% and 38% greater odds respectively of attending the recommended number of ANC visits compared with women with low disagreement, and in Myanmar women with medium disagreement had 46% greater odds. In Myanmar women who had high disagreement with reasons to justify wife beating had 33% greater odds, and in Cambodia 43% greater odds, of attending the recommended number of ANC visits compared with women with low disagreement.

Decision-making power was significantly associated with number of ANC visits in Cambodia and Indonesia. In Indonesia women with a medium level of decision-making power had 32% greater odds of attending the recommended number of ANC visits, and in Cambodia 47% greater odds, compared with women with low decision-making power. Women's knowledge level was associated with the number of ANC visits in Cambodia, Indonesia, and Myanmar. In Myanmar women with a medium level of knowledge had 37% greater odds of attending the recommended number of ANC visits compared with women with low knowledge. Similarly, in Myanmar women with a high level of knowledge had 44% greater odds, and in Indonesia 70% greater odds, of attending the recommended number of ANC visits compared with women with low knowledge.

Table 3 also shows a significant association between women's knowledge level and mother's age in Cambodia. In this country adolescent mothers with a medium level of knowledge had 56% lower odds of attending the recommended number of ANC visits compared with adult women with a low level of knowledge (the reference group).

Table 2. Distribution of number of ANC visits and timing of first ANC visit by women's socioeconomic and empowerment indicators in Cambodia, Indonesia, Myanmar, Philippines, and Timor-Leste

Variables	Cambodia (N=5,112)			Indonesia (N=12,902)			Myanmar (N=2,536)			Philippines (N=4,336)			Timor-Leste (N=4,558)		
	N	visits <4 ^a (%)	≥4 months ^b (%)	N	visits <4 ^a (%)	≥4 months ^b (%)	N	visits <4 ^a (%)	≥4 months ^b (%)	N	visits <4 ^a (%)	≥4 months ^b (%)	N	visits <4 ^a (%)	≥4 months ^b (%)
Wealth quintile															
Lowest	1,087	31.5	23.5	2,377	20.6	28.3	598	49.3	56.5	1,076	21.4	45.8	796	45.6	56.3
Second	1,048	26.2	22.8	2,444	9.9	20.0	538	37.6	52.8	963	13.9	40.4	825	42.5	52.1
Middle	973	19.8	16.8	2,606	5.9	15.6	442	31.2	56.2	881	9.3	33.1	955	34.3	51.6
Fourth	940	12.3	11.2	2,863	4.2	12.2	497	24.0	56.4	784	8.3	30.6	942	31.9	45.9
Highest	1,063	10.3	10.4	2,611	2.3	6.7	461	8.3	44.6	633	2.5	15.4	1039	29.6	37.0
Labor force participation															
Low	1,807	22.1	20.0	4,510	9.7	18.7	816	31.7	55.0	1,355	16.9	41.1	1583	39.8	45.0
Medium	1,690	24.6	20.7	4,028	8.7	16.7	755	36.0	51.8	1,487	10.0	34.8	1495	38.5	51.5
High	1,615	13.7	10.0	4,364	6.3	13.2	965	27.2	53.5	1,493	10.0	29.2	1480	29.9	47.7
Disagreement with reasons to justify wife beating															
Low	1,628	26.4	20.8	4,066	10.5	18.1	832	38.3	55.4	1,292	17.0	39.1	1423	34.8	54.3
Medium	1,817	19.6	17.4	4,282	9.1	17.4	897	30.6	52.6	1,458	12.0	33.9	1578	37.7	46.7
High	1,668	14.9	13.2	4,554	5.5	13.4	807	24.7	52.5	1,586	8.4	32.2	1557	35.9	43.7
Decision-making power															
Low	1,468	23.9	18.2	4,224	9.9	18.2	922	31.2	52.3	1,406	12.3	33.3	1337	40.0	52.1
Medium	1,790	18.2	17.9	4,318	6.5	14.2	831	28.9	52.7	1,482	11.7	33.8	1480	37.9	52.5
High	1,853	19.4	15.4	4,361	8.5	16.3	782	33.9	55.7	1,448	12.4	37.5	1742	31.8	41.0
Women's knowledge level															
Low	1,801	25.5	23.1	4,183	13.0	21.5	775	44.5	57.1	1,354	17.7	40.8	1704	34.9	45.9
Medium	1,752	20.8	16.7	4,353	7.7	15.7	850	29.5	55.6	1,418	11.6	35.6	1502	37.6	48.8
High	1,559	13.6	10.6	4,366	4.4	11.8	911	21.7	48.5	1,563	7.8	29.0	1352	36.3	49.7

^a ANC visits took place < 4 times during the pregnancy.

^b The first ANC visit was at ≥4 months of gestation.

Table 3. Adjusted odds ratios of the association between women's empowerment indicators and number of ANC visits adjusted for covariates

Variables	Cambodia		Indonesia		Myanmar		Philippines		Timor-Leste	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Age at birth										
Adult (Ref.)	1		1		1		1		1	
Adolescent	0.96	0.56 - 1.64	0.64**	0.47 - 0.88	0.44***	0.27 - 0.70	0.83	0.58 - 1.19	0.90	0.63 - 1.29
Labor force participation										
Low (Ref.)	1		1		1		1		1	
Medium	1.14	0.91 - 1.42	1.00	0.80 - 1.23	0.92	0.70 - 1.20	1.33*	1.02 - 1.72	1.070	0.88 - 1.32
High	1.32*	1.03 - 1.69	1.12	0.89 - 1.41	1.1	0.84 - 1.45	1.36*	1.05 - 1.75	1.65***	1.34 - 2.03
Disagreement with reasons to justify wife beating										
Low (Ref.)	1		1		1		1		1	
Medium	1.39**	1.12 - 1.73	1.38**	1.10 - 1.73	1.46*	1.09 - 1.96	1.20	0.94 - 1.54	0.84	0.68 - 1.04
High	1.43**	1.12 - 1.83	1.18	0.91 - 1.52	1.33*	1.01 - 1.75	1.37	0.99 - 1.89	0.91	0.72 - 1.16
Decision-making power										
Low (Ref.)	1		1		1		1		1	
Medium	1.47***	1.18 - 1.84	1.32*	1.06 - 1.64	1.18	0.92 - 1.51	0.89	0.71 - 1.13	0.94	0.78 - 1.14
High	1.24	0.98 - 1.56	1	0.80 - 1.25	1.09	0.84 - 1.40	0.87	0.68 - 1.10	0.99	0.79 - 1.25
Women's knowledge level										
Low (Ref.)	1		1		1		1		1	
Medium	1.14	0.89 - 1.47	1.22	0.97 - 1.54	1.37*	1.07 - 1.75	1.01	0.79 - 1.28	1.01	0.85 - 1.21
High	1.38**	1.09 - 1.76	1.66***	1.28 - 2.16	1.44*	1.05 - 1.97	1.06	0.77 - 1.45	1.10	0.90 - 1.34
Difference between adolescent vs. adult mothers with low knowledge (Ref.)	1									
Difference between adolescent mothers with medium knowledge and adult mothers with low knowledge	0.44*	0.22 - 0.89								
Difference between adolescent mothers with high knowledge and adult mothers with low knowledge	0.83	0.43 - 1.59								
Number of observations	4,899		12,869		2,680		4,408		4,552	
Population size	5112		12902		2536		4336		4558	

*** p<0.001, ** p<0.01, * p<0.05

3.3 Timing of First ANC Visit

Table 4 shows that women's labor force participation was significantly associated with attending the first ANC visit in the first 4 months in Cambodia and Philippines. In Philippines women with high participation in the labor force had 29% higher odds of attending the first ANC visit in the first trimester, and in Cambodia 80% higher odds, compared with women with low labor force participation. Disagreement with reasons to justify wife beating was significantly associated with early ANC visits only in Timor-Leste, where women with a medium level of disagreement had 30% greater odds, and women with high disagreement had 39% greater odds, of attending the first ANC in the first trimester compared with women with low disagreement with reasons to justify wife beating.

Women's decision-making power was associated with early ANC visit only in Philippines, where women with high decision-making power had 20% lower odds of attending the first ANC in the recommended first 4 months of gestation compared with women with low decision-making power. Women's knowledge level was associated with early first ANC visit only in Cambodia, where women with a high level of knowledge had 75% greater odds of attending the first ANC visit early compared with women with low knowledge.

As Table 4 shows, we found a significant interaction between labor force participation and mother's age at birth in Myanmar. In this country, adolescent mothers with high labor force participation had 3.5 times greater odds of attending the first ANC early compared with the reference group of adult mothers with low labor force participation.

Table 4. Adjusted odds ratios of the association between women's empowerment indicators and timing of first ANC visit adjusted for covariates

Variables	Cambodia		Indonesia		Myanmar		Philippines		Timor-Leste	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Age at birth										
Adult (Ref.)	1		1		1		1		1	
Adolescent	0.64*	0.44 - 0.92	0.65***	0.51 - 0.82	0.55	0.25 - 1.18	0.64**	0.48 - 0.84	0.90	0.63 - 1.29
Labor force participation										
Low (Ref.)	1		1		1		1		1	
Medium	1.25	0.98 - 1.60	1.03	0.86 - 1.22	1.06	0.82 - 1.38	1.07	0.89 - 1.30	1.05	0.84 - 1.31
High	1.84***	1.41 - 2.41	1.16	0.97 - 1.38	0.92	0.73 - 1.16	1.29**	1.08 - 1.55	1.06	0.86 - 1.31
Disagreement with reasons to justify wife beating										
Low (Ref.)	1		1		1		1		1	
Medium	1.24	0.99 - 1.56	1.14	0.96 - 1.37	1.11	0.90 - 1.38	1.06	0.90 - 1.26	1.30*	1.06 - 1.59
High	1.22	0.96 - 1.53	1.02	0.86 - 1.21	1.05	0.82 - 1.35	1.09	0.87 - 1.36	1.39**	1.10 - 1.76
Decision-making power										
Low (Ref.)	1		1		1		1		1	
Medium	1.09	0.88 - 1.35	1.19	0.99 - 1.43	1.00	0.79 - 1.25	0.93	0.77 - 1.11	0.88	0.73 - 1.06
High	1.20	0.92 - 1.56	1.04	0.88 - 1.23	0.97	0.74 - 1.26	0.80*	0.67 - 0.95	1.06	0.86 - 1.31
Women's knowledge level										
Low (Ref.)	1		1		1		1		1	
Medium	1.27	0.98 - 1.64	1.10	0.92 - 1.32	1.03	0.82 - 1.31	0.96	0.80 - 1.14	1.05	0.88 - 1.25
High	1.75***	1.33 - 2.30	1.19	0.96 - 1.48	1.23	0.92 - 1.65	1.02	0.82 - 1.26	1.03	0.84 - 1.26
Difference between adolescent vs. adult mothers with low labor force participation (Ref.)										
Difference between adolescent mothers with medium labor force participation vs. adult mothers with low labor force participation					1.40	0.54 - 3.64				
Difference between adolescent mothers with high labor force participation vs. adult mothers with low labor force participation										
Number of observations	4,899		12,869		3,52*	1,29 - 9,58	4,408		4,552	
Population size	5112		12902		2,680		4,336		4,558	

*** p<0.001, ** p<0.01, * p<0.05

4 Discussion and Conclusions

4.1 General Findings

We found that type of women's empowerment associated with using ANC services differed across the five ASEAN countries in the study. Labor force participation was associated with making the recommended number of ANC visits in Cambodia, Philippines, and Timor-Leste. Disagreement with reasons to justify wife beating and women's knowledge level each were associated with number of ANC visits in Cambodia, Indonesia, and Myanmar. Women's decision-making power was associated with number of ANC visits in Cambodia and Indonesia.

Early first ANC visit was associated with women's empowerment only in Philippines. Labor force participation was associated with early first ANC visit in Cambodia and Philippines. Disagreement with reasons to justify wife beating was associated with early first ANC visit only in Timor-Leste, while women's knowledge level was associated with early first ANC visit only in Cambodia. Unlike the other women's empowerment indicators that showed a positive association with early first ANC visit, decision-making power showed a significant negative association with early first ANC visit in Philippines.

Adolescent mothers generally attended fewer ANC visits and came for the first ANC visit later compared with adult mothers. There was no age difference in the association between women's empowerment and number of ANC visits except in Cambodia, where adolescent mothers with a medium knowledge level had lower odds of making four or more ANC visits compared with the reference group of adult mothers with low knowledge. Also in Myanmar, adolescent mothers with a high level of labor participation had higher odds of attending first ANC early in the pregnancy compared with the reference group of adult women with low labor force participation.

4.2 Comparison with Other Studies

Generally, our study supports the findings from a review of 67 studies in developing countries that women's empowerment is positively associated with the use of health care services (Pratley 2016). Similar to our findings, a study in India reported that younger women were less likely to have adequate ANC (Singh and Singh 2014).

Specifically, our study found that women with high labor force participation had 32%-65% higher odds of attending four or more ANC visits in Cambodia, Philippines, and Timor-Leste. Our results were similar to an analysis of the 2007 Bangladesh DHS showing that women with a high level of employment and economic decision-making power had 56% greater odds of attending four or more ANC visits (Haque et al. 2012).

Women who had high disagreement with all reasons for wife beating had 18%-43% higher odds of attending four or more ANC visits in Cambodia, Indonesia, and Myanmar. This estimate is

similar to that of the study in Bangladesh, which reported 19% greater odds of making the recommended number of ANC visits among women with high disagreement with reasons for wife beating (Haque et al. 2012).

Differing from our results, data from the Tajikistan Living Standards Survey 2007 showed that women's decision-making on household financial issues had a negative association with the probability of attending four or more ANC visits, while it was positively associated with the likelihood of attending at least one ANC visit (Kamiya 2011). We could not compare our estimate directly with the study from Bangladesh (Haque et al. 2012), which combined women's decision-making power of family health care and family planning. However, the difference between women with medium and low decision-making power in our study (32% versus 47%) was similar to the difference between women with high and low familial health care and family planning decision-making power in Bangladesh, which showed 43% greater odds of attending a sufficient number of ANC visits among women with a high level of decision-making power compared with those with low-level decision-making power (Haque et al. 2012).

Our estimates for the association between women's knowledge level and number of ANC visits were lower (38%-66%) compared with a pooled analysis of DHS data from 33 developing countries reporting that women with complete primary education had almost three times greater odds of attending four or more ANC visits compared with women with less or no education (Ahmed et al. 2010). In rural India adolescent mothers who had high school or higher education had nearly three times higher odds of having full ANC (attending four or more ANC visits, had tetanus toxoid injection, and received iron-folic acid) compared with illiterate adolescent mothers (Singh et al. 2012). Our finding was closer to the study in Bangladesh, where women who attended secondary or higher education had 5.4 times greater odds of attending four or more ANC visits (Haque et al. 2012). In Timor-Leste, women who did not have any formal education had 54% greater odds of making fewer than four ANC visits (Khanal et al. 2015), which is within the range of our estimates. Although we could not directly compare our results with another study using DHS data in Indonesia, the direction of the association was similar to our findings. The study found that women in Indonesia in the poorest households who had only primary education or no education had nearly nine times greater odds of not attending the recommended four ANC visits compared with women in the wealthiest households who had completed secondary education or a higher level (Titaley, Dibley, and Roberts 2010).

4.3 Possible Mechanism

Labor force participation was not a significant factor for number of ANC visits in Indonesia and Myanmar, possibly because women might not necessarily use the cash they earned for maternal

health care. Disagreement with reasons to justify wife beating was a significant factor for ANC visits in Cambodia, Indonesia, and Myanmar, but not in Philippines and Timor-Leste. The finding of non-significant association may be because the proportion of women in Philippines who disagreed with all reasons for wife beating was very high (84%), and in Timor-Leste very low (11%).

The link between disagreement with reasons for wife beating and attending ANC visits may be similar to the link between experiencing domestic violence and attending ANC visits. In Timor-Leste, for example, women who experienced combined physical, sexual, or emotional violence at home were likely to have fewer ANC visits compared with women who did not experience domestic violence (Taft, Powell, and Watson 2015). Similar to women who experienced domestic violence, women who have low disagreement with reasons to justify wife beating may have limited mobility to attend ANC due to partner's control and thus be less likely to take part in activities outside of home (Nahrgang 2016).

In Cambodia and Myanmar women's decision-making power indicated that they were in a good position to decide for themselves whether to go for ANC. Women in other countries may be in the same position, but our findings were not statistically significant. In Cambodia, Indonesia, and Myanmar, women's knowledge level, an indicator created from a combination of formal education and access to media, may indicate an understanding of the importance of ANC that could lead women with a high level of knowledge to attend ANC. In Philippines and Timor-Leste, however, women with a high level of formal education and good access to media may not have good knowledge of the importance of maternal health care, and thus did not become a significant factor, leaving labor force participation as the only significant empowerment factors for ANC in these two countries.

Early first ANC visit was associated with a lower number of women's empowerment factors in all countries. Early first ANC visit may be more affected by whether women were aware of their pregnancy early in the gestation. We could not offer any other possible explanation for the reason that women with high decision-making power in the Philippines had significantly lower odds of attending the first ANC early in the first trimester compared with women with a low decision-making power.

The significant interaction between women's age at birth and knowledge level in Cambodia for number of ANC visits, and women's age at birth and labor force participation in Myanmar for ANC timing, suggests that there might be different mechanisms between the decisions to attend ANC for young mothers and for adult mothers. Compared with adult mothers, an increase in knowledge from a low to a medium level among adolescent mothers was associated with lower odds of making ANC visits in Cambodia. This could be because adolescent mothers might rely more on maternal health decisions made for them by their family members. Indeed, their pregnancy was likely to be their first experience, and thus their knowledge of maternal health-seeking behavior was not optimal.

4.4 Strengths and Weaknesses

To our knowledge, this is the first study to report the association of women's empowerment and ANC in the ASEAN region. We found significant associations between women's empowerment indicators and number of ANC visits, even after adjustment for the effect of household wealth. The strength of the study is that we used the latest data from nationally representative surveys in five different ASEAN countries and thus can compare the findings between countries. We included four components of women's empowerment (labor force participation, disagreement with reasons to justify wife beating, decision-making power, and knowledge level) that were derived from 17 different variables. We included number of ANC visits and timing of the first to provide a broad perspective on use of ANC. We also compared adolescent and adult mothers to assess the possible differential association between ANC and women's empowerment by women's age.

We excluded never-married women from the DHS datasets. As such, we may have underestimated the association between ANC and adolescent pregnancies. However, the number of births among never-married women excluded was low (0.1% in Indonesia, 3.4% in Philippines, and 0.06% in Timor-Leste), so we expect that the underestimation also was low. DHS did not assess a direct measure of maternal health knowledge. However, we were able to combine women's level of education and access to media to create a proxy indicator for this factor.

5. Conclusion

In conclusion, the type of women's empowerment associated with ANC use is different across the five ASEAN countries studied. In general, women's empowerment status is significantly associated with total number of ANC visits in more of the countries than is the case for timing of women's first ANC visit.

6. Policy Implication and Further Study

This study showed that use of ANC is associated with several factors related to women's empowerment status, as well as to health care decision-making itself. Improving the prevalence of recommended number of ANC visits as well as early ANC visits requires multi-sectoral approaches. It is likely that improving women's access to the labor force, such as creating job opportunities, providing incentives on women's entrepreneurship, and providing specific policies to support women at work, especially in Cambodia, Philippines, and Timor-Leste, can improve use of ANC and thus achieve better maternal and child health in ASEAN countries. Other possible interventions to empower women include developing community-based women's groups and improving women's access to health information through the media, especially in Cambodia, Indonesia, and Myanmar. The issue of women's empowerment and maternal health outcomes should be addressed in ASEAN to accelerate attainment of the SDG targets. We recommend further studies to assess the efficacy of such interventions in improving ANC and subsequent maternal and child health indicators in ASEAN countries.

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