Effects of Maternal Decisional Authority and Media Use on Vaccination for Children in Asian Countries

Minsung Sohn 1, Leesa Lin 2,3 and Minsoo Jung 4,5,*

1 BK21Plus Program in Embodiment: Health-Society Interaction, Department of Public Health Sciences, Graduate School of Korea University, Seoul 02841, Korea; minsinge@naver.com
2 Department of Public Health, Environments and Society, London School of Hygiene & Tropical Medicine, London WC1H 9SH, UK; leesa_lin@hms.harvard.edu
3 Department of Global Health and Social Medicine, Harvard Medical School, Boston 02115, MA, USA
4 Department of Health Science, Dongduk Women’s University, Seoul 136-714, Korea
5 Center for Community-Based Research, Dana-Farber/Harvard Cancer Center, Boston 02215, MA, USA
* Correspondence: mins.jung@gmail.com; Tel.: +82-2-940-4483

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Abstract: Background and objectives: It is now accepted that vaccination is a critical public health strategy in preventing child morbidity and mortality. Understanding factors that promote vaccination is a critical first step. The objective of this study was to investigated associations of maternal decisional authority and media use on vaccination for children in six South and Southeast Asian countries. Materials and Methods: Data come from demographic and health surveys conducted in Bangladesh, Cambodia, Indonesia, Nepal, Pakistan, and the Philippines between 2011 and 2014 (N = 45,168 women). Main outcome variables were four types of basic vaccination for children. Independent variables were maternal decisional authority and media use. Hierarchical multivariable regression analyses were performed to examine associations. Results: Children of mothers who had more decisional authority were more likely to be vaccinated compared to those participants who did not have such authority. The likelihood to have their children vaccinated was higher among women who frequently used media than those who did not use media. Conclusions: Maternal decisional authority and media use are related to improved vaccination for children. To increase vaccination rates in developing countries in South and Southeast Asia, programs and policies that promote maternal decisional authority and the use of media for health need to be implemented to help families and local communities.

Keywords: vaccination; women’s decisional authority; media use; health communication; Southeast Asia; South Asia

1. Introduction

The development of mass media has enabled women to participate in daily affairs outside home, including education, health, governance, and other areas [1]. Empowerment of women is a process of providing power to woman to become free from the control of others, that is, to assume power to control their own lives and determine their own conditions [2,3]. Women’s empowerment may also be understood as a process of providing equal rights, opportunities, responsibilities, and power positions to women so that they can play a role in society on par with men [4,5].

Inequality in maternal and child healthcare utilization is related to women’s economic, educational, and empowerment statuses (3Es) [6]. These 3Es are indispensable for realizing the Millennium Development Goals (MDGs). Undesirable social environment of insufficient 3Es can weaken the effect of public health interventions and consolidate inequality [7]. In developing countries,
a diverse set of delays (e.g., delays in obtaining medical services, delays in arriving at medical institutions, and delays in providing medical services) can adversely affect maternal and child health [8]. Delays related to health and medical care are potential causes of high child mortality ratios (CMRs). These 3Es have been found to be one set of important antecedents to CMR [6–8].

Today, information technology has changed the communication paradigm between medical professionals and the public, making it no longer difficult to reach a large number of people. Widespread availability of information through the penetration of mass media has played a significant role in the empowerment of women by easing access and reducing barriers [1–3]. Despite its importance for maternal and child health, female empowerment in developing countries has not been adequately addressed yet. Health-related empowerment of women here refers to their ability to make their own decisions, including vaccinations for their children [9]. More appropriately, it may be defined as the decisional authority of women of childbearing age over maternal health. It also encompasses safe home and public spaces for women, ensuring their economic autonomy and security, and increasing their participation and decision-making power. For example, violence against women and girls is rooted in gender-based discrimination, social norms, and gender stereotypes that perpetuate such violence [6,9].

For countries in South and Southeast Asia, the lack of women’s decision-making and the lack of economic empowerment can cause worsening of health for women and children [3,4,6,8]. Especially, Pakistan is still suffering from the outbreak of polio. There were also unusual cases that workers who had polio were killed. Empowering women in these developing countries has become a primary policy goal since the World Congress on Women, 1995 held in Beijing, China [9]. Although, vaccines are one of the most cost-effective public health measures available, they are undervalued throughout the world. Children in Southeast Asia are still suffering from various vaccine-preventable diseases. Protection against newly developed vaccines such as pneumococcus, rotavirus, and human papillomavirus infections were inadequate in most of these countries in South and Southeast Asia [10]. Promoting coverage of newly developed vaccines will benefit a great number of children in this area. The purpose of this study was to determine the effect of women’s decisional authority and media use on decisions related to vaccinations in South and Southeast Asian countries (Bangladesh, Cambodia, Indonesia, Nepal, Pakistan, and the Philippines).

2. Methods

2.1. Study Sample

Data used for this study were pooled from the latest Demographic and Health Surveys (DHS) conducted in six available South and Southeast Asia countries (Bangladesh: 2011; Cambodia: 2014; Indonesia: 2012; Nepal: 2011; Pakistan: 2012; the Philippines: 2013) with different survey years due to country-specific situations. Nationally representative surveys of 5000 to 30,000 households were periodically performed in low- and middle-income countries. DHS were based on multi-stage stratified sample of households from census enumeration areas in urban or rural villages. Each country’s sample size was calculated by applying that country’s urban and rural population proportions and the country’s gender ratio. In all households, women aged 13–49 years were eligible to participate. Country-specific details of the survey can be found on the following web page [11]. DHS data including demographic characteristics, women’s decisional authority, mass media use, and vaccination status were obtained through face-to-face interviews. Response rates were higher than 90% among all DHS participants in South and Southeast Asia countries. After excluding responses with missing values, a total of 45,168 women in Southeast Asia countries were used in the final analysis.
2.2. Study Design

This was a cross-sectional study to examine the association between women’s decisional authority, mass media and vaccination for children (i.e., vaccine coverage rates of the children) using DHS data obtained from South and Southeast Asia.

2.3. Measures

2.3.1. Dependent Variables

The dependent variable for this study was vaccination for children. It was assessed by asking “Now think about getting the vaccine for your child/children. Have you vaccinated one or all of your children?” The response was categorized as “yes” or “no”. Four binary variables were generated for the following four vaccinations: Bacillus Calmette-Guerin (BCG), diphtheria + pertussis + tetanus (DPT), poliomyelitis (polio), and measles.

2.3.2. Independent Variables

For this study, women’s decisional authority and media were used as independent variables.

Women’s decisional authority was considered as women having two dimensions of decision-making in daily life and attitudes toward intimate partner violence in DHS data. Decision making in daily life was measured using the following three questions: “Who usually makes decisions about health care for yourself?”; “Who usually makes decisions about making major household purchases?”; and “Who usually makes decisions about visits to your family or relatives?” Responses were grouped into three categories: (1) partner decides, (2) partner and woman decide jointly, and (3) woman decides. Regarding attitudes toward partner violence, the following five domestic scenarios with yes-no questions was asked: “In your opinion, is a husband justified in hitting or beating his wife in the following situations? (1) goes out without telling him, (2) neglects children, (3) argues with him, (4) refuses to have sex, and (5) burns food.”

Exploratory factor analysis was conducted with a total of nine total questions to multi-dimensionally assess women’s decisional authority [11]. Exploratory factor analysis was performed with Varimax rotation to determine the construct validity. Factors used to construct the women’s decisional authority index had eigenvalues greater than 1 and factor loadings greater than 0.40. The first factor, named decision-making in daily life, accounted for 24.7% of the total variance (Cronbach’s alpha = 0.733). The use of this dimension was validated in previous studies on women empowerment [11]. This factor included three of nine decisional authorities: “decisions about health care for yourself; decisions about making major household purchases; and decisions about visits to your family or relatives” In accordance with approaches used in previous studies [12], a second factor, named freedom from domination, explained 24.1% of the total variance (Cronbach’s alpha = 0.816). This factor included two potential decisional authorities: “goes out without telling him; and neglects children.” A third factor, named self-assertion, explained 23.2% of the total variance (Cronbach’s alpha = 0.763). This factor included the remaining three potential decisional authority dimensions: “argues with her husband; refuses to have sex; and burns food.” These factors were transformed into scores by aggregating answers of relevant sub-questions.

Media use was assessed in this study to identify other effects on outcome variables. How often participants used three mass media types (newspaper, radio, and television) was considered. Responses were grouped into four categories: (1) not at all, (2) less than once a week, (3) at least once a week, and (4) almost every day.

2.3.3. Covariates

It has been previously reported that child and maternal health are related to demographic characteristics of respondents [13–15]. Accordingly, mother’s age, socio-economic position (SEP; i.e., educational attainment, household income), and location were considered as covariates in this study.
Participants were grouped into the following age categories: 13–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49 years old. Educational attainments were grouped into the following categories: no schooling, elementary school/associate degree, middle school/associate degree, and high school/associate degree or higher. Household income was grouped into the following standard categories: the lowest 20% (first quintile), low 20%, middle 20%, high 20%, and the highest 20% (fifth quintile). Location was grouped into urban and rural.

2.4. Statistical Analyses

First, general characteristics of the sample were described. Distribution of vaccination of children and utilization of maternal health service were also assessed. Second, hierarchical multivariable logistic regression analysis was performed to examine the association between women’s decisional authority factors and vaccination of children after conducting exploratory factor analysis. Poisson regression was used because dependent variables were count measures with a skewed nonparametric distribution that standard parametric approaches such as linear regression were not statistically appropriate [16]. The association between women’s decisional authority and vaccination for her children (mother’s vaccine coverage rates for the children and utilization of maternal health service) stratified by frequency of media use (newspaper, radio, and television) was also assessed. All statistical analyses were conducted using STATA v. 14.0 (STATA, College Station, TX, USA).

2.5. Ethics Statement

Approval for the study was granted by the Korea National Institute for Bioethics Policy Institutional Review Board (25 November 2016; P01-201611-21-009). All participants gave written informed consent to participate. The Ethics Committees of the Demographic Health Survey approved this consent procedure. During the investigation process, no information that could distinguish individual participants was collected.

3. Results

3.1. Sample Demographic Characteristics

As detailed in Table 1, a total of 45,168 female participants were recruited from six countries, including 15,579 from Indonesia (34.5%), 7009 from Pakistan (15.5%), 6917 from Bangladesh (15.3%), 6169 from Cambodia (13.7%), 6125 from the Philippines (13.6%), and 3369 from Nepal (7.5%). Age patterns were similar across countries among participants. Those who were 25–29 years old accounted for the most, ranging from 25.26% in Philippines to 35.44% in Nepal. Regarding educational attainment, most participants had middle school/associate degree in Indonesia (53.64%), the Philippines (48.83%), and Bangladesh (40.22%), while most participants had elementary school/associate degree in Pakistan (59%), Nepal (50.73%), and Cambodia (49.88%). With respect to household income, the proportion of participants in the lowest quintile (first) was higher than that of other groups except for participants in Cambodia, including the highest (fifth) most common. The proportion of urban residence was low in all six countries, ranging from 22.08% in Nepal to 46.71% in Indonesia.

Regarding women’s decision-making in daily life, Pakistan had the highest proportion of women who reported that their health care, household purchases, and visits to family or relatives were decided by the partner (47.31%, 48.28%, and 44.39%, respectively). Regarding women’s freedom from domination, the highest proportion of participants among six countries answered that their husband was justified in hitting or beating them if they went out without telling him in Pakistan (36.50%) and neglected the children in Cambodia (45.05%). Pakistan also had the highest proportion of women for all women’s self-assertion items that their husband was justified in hitting or beating them if they argued with husband (40.41%), refused to have sex (36.64%), and burned food (21.73%).
Table 1. General characteristics of the study sample (N = 45,168).

|                | Bangladesh (2011) N = 6917 | Cambodia (2014) N = 6169 | Indonesia (2012) N = 15579 | Nepal (2014) N = 3369 | Pakistan (2012) N = 7009 | Philippines (2013) N = 6125 |
|----------------|-----------------------------|---------------------------|-----------------------------|-----------------------|---------------------------|-----------------------------|
|                | N (%)                       | N (%)                     | N (%)                       | N (%)                 | N (%)                     | N (%)                       |
| **Age**        |                             |                           |                             |                       |                           |                             |
| 13–19          | 791                         | 11.44                     | 473                         | 3.04                  | 132                       | 3.92                        |
| 20–24          | 2374                        | 34.32                     | 2865                        | 18.39                 | 848                       | 25.17                       |
| 25–29          | 1966                        | 28.42                     | 4476                        | 28.73                 | 1194                      | 35.44                       |
| 30–34          | 1105                        | 15.98                     | 3882                        | 24.92                 | 653                       | 19.38                       |
| 35–39          | 472                         | 6.82                      | 2601                        | 16.70                 | 349                       | 10.36                       |
| 40–44          | 178                         | 2.57                      | 1079                        | 6.93                  | 149                       | 4.42                        |
| 45–49          | 31                          | 0.45                      | 78                          | 1.26                  | 203                       | 6.10                        |
| **Educational attainment** |                   |                           |                             |                       |                           |                             |
| Uneducated     | 1406                        | 20.33                     | 813                         | 13.18                 | 399                       | 2.56                        |
| Elementary school/associate degree | 2158                      | 31.20                     | 3077                        | 49.88                 | 2616                      | 19.06                       |
| Middle school/associate degree | 2782                      | 40.22                     | 2037                        | 33.02                 | 8357                      | 53.64                       |
| High school/associate degree or higher | 571                       | 8.26                      | 242                         | 3.92                  | 2207                      | 14.17                       |
| **Household income** |                   |                           |                             |                       |                           |                             |
| First quintile (the lowest) | 1650                      | 23.85                     | 1401                        | 22.71                 | 4442                      | 28.51                       |
| Second quintile | 1395                        | 20.17                     | 1169                        | 18.95                 | 3119                      | 19.26                       |
| Third quintile | 1278                        | 18.48                     | 964                         | 15.63                 | 2847                      | 17.31                       |
| Fourth quintile | 1272                       | 18.39                     | 1079                        | 17.49                 | 2696                      | 17.31                       |
| Fifth quintile (the highest) | 1322                      | 19.11                     | 1556                        | 25.22                 | 2475                      | 15.89                       |
| **Location**   |                             |                           |                             |                       |                           |                             |
| Urban          | 2187                        | 31.62                     | 1705                        | 27.64                 | 7277                      | 46.71                       |
| Rural          | 4730                        | 68.38                     | 4464                        | 72.36                 | 8302                      | 53.29                       |
| **Decision-making in daily life** |                 |                           |                             |                       |                           |                             |
| (1) Woman’s health care |                   |                           |                             |                       |                           |                             |
| Partner decides | 2317                       | 33.50                     | 496                         | 8.04                  | 2329                      | 14.95                       |
| Jointly        | 3819                        | 55.21                     | 3077                        | 49.91                 | 7776                      | 49.91                       |
| Woman decides alone | 781                       | 11.29                     | 2594                        | 42.05                 | 5474                      | 35.14                       |
| (2) Household purchases |                   |                           |                             |                       |                           |                             |
| Partner decides | 2463                       | 35.61                     | 335                         | 5.75                  | 2646                      | 16.98                       |
| Jointly        | 4037                        | 58.36                     | 4946                        | 80.18                 | 9857                      | 63.27                       |
| Woman decides alone | 417                       | 6.03                      | 868                         | 14.07                 | 3076                      | 19.74                       |
| (3) Visiting to family or relatives |             |                           |                             |                       |                           |                             |
| Partner decides | 2338                       | 33.80                     | 196                         | 3.18                  | 2321                      | 14.90                       |
| Jointly        | 3997                        | 57.79                     | 4838                        | 78.42                 | 11,248                     | 72.20                       |
| Woman decides alone | 582                       | 8.41                      | 1135                        | 18.40                 | 2010                      | 12.90                       |
| **Freedom from domination** |                   |                           |                             |                       |                           |                             |
| (1) Goes out without telling him |                 |                           |                             |                       |                           |                             |
| Yes            | 1170                        | 16.91                     | 2084                        | 33.78                 | 4257                      | 27.33                       |
| No             | 5747                        | 83.09                     | 4085                        | 66.22                 | 11,322                     | 72.67                       |
| (2) Neglects the children |             |                           |                             |                       |                           |                             |
| Yes            | 1351                        | 19.53                     | 2779                        | 45.05                 | 4603                      | 29.55                       |
| No             | 5566                        | 80.47                     | 3390                        | 54.95                 | 10,976                     | 70.45                       |
| **Self-assertion** |                   |                           |                             |                       |                           |                             |
| (1) Argues with him |                 |                           |                             |                       |                           |                             |
| Yes            | 1606                        | 23.22                     | 1533                        | 24.85                 | 1191                      | 7.64                        |
| No             | 5311                        | 76.78                     | 4635                        | 75.15                 | 14,388                     | 92.36                       |
| (2) Refuses to have sex |             |                           |                             |                       |                           |                             |
| Yes            | 611                         | 8.83                      | 758                         | 12.29                 | 1493                      | 9.58                        |
| No             | 6306                        | 91.17                     | 5411                        | 87.71                 | 14,086                     | 90.42                       |
| (3) Burns food |                 |                           |                             |                       |                           |                             |
| Yes            | 281                         | 4.06                      | 704                         | 11.41                 | 516                       | 3.31                        |
| No             | 6636                        | 95.94                     | 5465                        | 88.59                 | 15,063                     | 96.69                       |
| **Newspaper use** |                   |                           |                             |                       |                           |                             |
| Not at all     | 5813                        | 84.04                     | 4745                        | 76.92                 | 7879                      | 50.57                       |
| Less than once a week | 679                       | 9.82                      | 1071                        | 17.36                 | 5672                      | 36.41                       |
| At least once a week | 425                       | 6.14                      | 353                         | 5.72                  | 2028                      | 13.02                       |
| Daily          | 0                           | 0.00                      | 0                           | 0.00                  | 0                         | 0.00                        |
Among six countries, the country with the highest percentage of participants who did not use newspaper, radio, or television was Bangladesh (84.04%, 91.40%, and 41.75%, respectively), followed by Pakistan (76.96%, 84.29%, and 36.84%, respectively). The country with the highest percentage of participants who used mass media at least once a week was the Philippines (newspaper: 18.60%, radio: 46.89%, and television: 70.04%).

Among six countries, Pakistan had the lowest proportion of participants who reported that their children were vaccinated against BCG (77.56%), DPT (54.28%), and Measles (54.63%) while Indonesia had the lowest proportion of participants who reported that their children were vaccinated against Polio (69.31%).

Table 2 shows results of Pearson correlation coefficient analysis for examining the relationship among SEP, women empowerment (decision-making in daily life, freedom from domination, and self-assertion), and media use. A positive significant correlation existed between educational attainment and household income ($r = 0.4416$). Regarding women empowerment, there were positive significant correlations between sub-categories, with correlation coefficient ranging from 0.4010–0.6904. A weakly positive and significant correlation existed between media use type with correlation coefficient ranging from 0.1573–0.3141.
Table 2. Correlation coefficient among SEP, women empowerment, and media use.

| Educational attainment | Household Income | Woman’s Health Care | Household Purchases | Visiting to Family or Relatives | Goes out without Telling him | Neglects the Children | Argues with him | Refuses to Have Sex | Burns Food | Newspaper Use | Radio Use | Television Use |
|------------------------|------------------|---------------------|---------------------|-------------------------------|----------------------------|-----------------------|-----------------|-------------------|------------|---------------|-----------|----------------|
| 1                      |                  |                     |                     |                               |                           |                       |                 |                   |            |               |           |                |
| Household income       | 0.442            | 1                   |                     |                               |                           |                       |                 |                   |            |               |           |                |
| Woman’s health care    | 0.213            | 0.055               | 1                   |                               |                           |                       |                 |                   |            |               |           |                |
| Household purchases    | 0.164            | 0.053               | 0.470               | 1                             |                           |                       |                 |                   |            |               |           |                |
| Visiting to family or relatives | 0.154 | 0.055 | 0.465 | 0.517 | 1 |
| Goes out without telling him | 0.162 | 0.134 | 0.064 | 0.061 | 0.086 | 1 |
| Neglects the children  | 0.133            | 0.122               | 0.040               | 0.037                         | 0.054                     | 0.690                 | 1               |                   |            |               |           |                |
| Argues with him        | 0.253            | 0.132               | 0.140               | 0.134                         | 0.139                     | 0.514                 | 0.523           | 1                 |            |               |           |                |
| Refuses to have sex    | 0.223            | 0.128               | 0.146               | 0.122                         | 0.129                     | 0.477                 | 0.464           | 0.560             | 1          |               |           |                |
| Burns food             | 0.202            | 0.127               | 0.105               | 0.097                         | 0.100                     | 0.401                 | 0.403           | 0.500             | 0.537      | 1            |           |                |
| Newspaper use          | 0.503            | 0.351               | 0.143               | 0.113                         | 0.092                     | 0.104                 | 0.094           | 0.171             | 0.121      | 0.122        | 1        |                |
| Radio use              | 0.212            | 0.089               | 0.166               | 0.129                         | 0.141                     | 0.098                 | 0.079           | 0.153             | 0.125      | 0.097        | 0.314    | 1            |
| Television use         | 0.400            | 0.436               | 0.112               | 0.095                         | 0.072                     | 0.080                 | 0.069           | 0.167             | 0.107      | 0.129        | 0.314    | 0.157        |

The significance value of the association between all variables was less than 0.001.
3.3. Women Decisional Authority and Vaccination for Children

Table 3 presents odds ratios (OR) and 95% confidence intervals (CI) of the dimensions of women’s decisional authority and media use associated with four types of vaccination. Women with higher decisional authority levels had significantly higher odds of getting their children vaccinated compared to women with lower decisional authority in Model I after controlling socio-demographic factors. Regarding decision-making, the likelihood of having their children vaccinated against BCG was higher among women who made decisions alone about her health care (OR = 1.31, 95% CI = 1.18–1.46), making major household purchases (OR = 1.16, 95% CI = 1.03–1.31), and visits to her family or relatives (OR = 1.14, 95% CI = 1.01–1.28) than those who did not have decision-making authority. Similar to results obtained after analyzing adoption of BCG vaccines, women who had high decisional authority levels were significantly more likely to get their children vaccinated against DPT, polio, and measles.

Regarding their attitudes toward partner violence, participants who did not believe that a husband was justified in hitting his wife if she went out without telling him were more likely to get their children vaccinated against BCG (OR = 1.15, 95% CI = 1.04–1.27), polio (OR = 1.09, 95% CI = 1.01–1.17), and measles (OR = 1.08, 95% CI = 1.00–1.16) than were those who believed it was justified. Those who disagreed that a husband was justified in hitting or beating his wife if she argued with him were more likely to get their children vaccinated against BCG (OR = 1.19, 95% CI = 1.07–1.32) and measles (OR = 1.09, 95% CI = 1.01–1.17) than those who agreed that it was justified. However, the association between vaccination and attitudes toward partner violence if a woman neglected the children, refused to have sex, or burned food was not statistically significant.

When media use (newspaper, radio, and television) was added to Model II, the likelihood of having their children vaccinated (i.e., BCG, DPT, polio, and measles) was higher among those who frequently used media than those who did not use media at all after controlling for socio-demographic factors and women’s decisional authority. Participants who read a newspaper (OR = 2.80, 95% CI = 1.02–7.64) and watched television (OR = 1.86, 95% CI = 1.61–2.16) on a daily basis were more likely to get their children vaccinated against BCG than those who did not use either medium at all. Similarly, the likelihood of getting their children vaccinated against polio was higher among those who read newspaper at least once a week (OR = 1.13, 95% CI = 1.03–1.25) and listened to a radio daily (OR = 1.17, 95% CI = 1.08–1.34) than those who did not use either media at all. Regarding DPT, participants who frequently used media such as newspaper (OR = 1.21, 95% CI = 1.10–1.33), radio (OR = 1.25, 95% CI = 1.17–1.35), and television (OR = 1.86, 95% CI = 1.61–2.16) were more likely to have their children vaccinated against DPT than those who did not use media at all. Regarding measles vaccinations, it produced similar results. Participants who frequently used media such as newspaper (OR = 1.08, 95% CI = 1.01–1.14), radio (OR = 1.09, 95% CI = 1.02–1.17), and television (OR = 1.58, 95% CI = 1.42–1.77) were more likely to have their children vaccinated against measles than those who did not use media at all. In contrast, those who listened to radio on a daily basis (OR = 0.55, 95% CI = 0.35–0.86) were less likely to get their children vaccinated against BCG than those who did not listen to a radio at all. Also, the likelihood of getting their children vaccinated against DPT was lower among those who listened to a radio daily (OR = 0.62, 95% CI = 0.42–0.91) than those who did not listen to the radio at all.
Table 3. Odds ratio (OR) and 95% confidence interval (CI) of women empowerment and media use with four types of vaccination among six South and Southeast Asian countries in the DHS data (N = 45,168).

|          | BCG   |          |          | DPT   |          |          | Polio  |          | Measles |
|----------|-------|----------|----------|-------|----------|----------|--------|----------|---------|
|          | Model I | Model II | Model I  | Model II | Model I  | Model II | Model I  | Model II |
|          | aOR    | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   |
| Decision-making (1) woman’s health care |        |          |          |        |          |          |        |          |         |          |          |          |        |          |          |        |          |          |
|         | Partner decides (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 1.18† | 1.07, 1.30 | 1.12† | 1.04, 1.20 | 1.09, 1.09 | 1.06, 1.09 | 1.13, 1.13 | 1.16, 1.16 |          |          |          |          |          |          |          |          |          |
| Woman decides alone | 1.31‡ | 1.18, 1.46 | 1.14‡ | 1.14, 1.33 | 1.11‡ | 1.11, 1.11 | 1.15‡ | 1.15, 1.15 |          |          |          |          |          |          |          |          |          |
| Decision-making (2) household purchases |        |          |          |        |          |          |        |          |         |          |          |          |          |        |          |          |        |          |          |
|         | Partner decides (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 1.19‡ | 1.08, 1.16 | 1.07† | 1.06, 1.33 | 1.10, 1.33 | 1.12, 1.33 | 1.15‡ | 1.15, 1.15 |          |          |          |          |          |          |          |          |          |
| Woman decides alone | 1.16† | 1.14, 1.31 | 1.09‡ | 1.19, 1.19 | 1.10‡ | 1.19, 1.19 | 1.12† | 1.12, 1.12 |          |          |          |          |          |          |          |          |          |
| Decision-making (3) visiting to family or relatives |        |          |          |        |          |          |        |          |         |          |          |          |          |        |          |          |        |          |          |
|         | Partner decides (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 1.28‡ | 1.16, 1.32 | 1.16‡ | 1.18, 1.38 | 1.19, 1.33 | 1.19, 1.33 | 1.15‡ | 1.15, 1.15 |          |          |          |          |          |          |          |          |          |
| Woman decides alone | 1.14† | 1.16, 1.31 | 1.08‡ | 1.19, 1.19 | 1.10‡ | 1.19, 1.19 | 1.12† | 1.12, 1.12 |          |          |          |          |          |          |          |          |          |
| Attitudes on partner violence (1) goes out without telling him |        |          |          |        |          |          |        |          |         |          |          |          |          |        |          |          |        |          |          |
|         | Yes (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 1.15† | 1.04, 1.27 | 1.04† | 1.07, 1.15 | 1.09, 1.15 | 1.09, 1.15 | 1.02, 1.18 | 1.08, 1.08 |          |          |          |          |          |          |          |          |          |
| Attitudes on partner violence (2) neglects the children |        |          |          |        |          |          |        |          |         |          |          |          |          |        |          |          |        |          |          |
|         | Yes (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 0.94 | 0.85, 1.05 | 0.92 | 0.99, 1.06 | 0.97 | 0.90, 1.04 | 0.97 | 0.91, 1.05 |          |          |          |          |          |          |          |          |          |
| Attitudes on partner violence (3) argues with him |        |          |          |        |          |          |        |          |         |          |          |          |          |        |          |          |        |          |          |
|         | Yes (Ref.) |        |          |         |         |          |         |         |          |         |         |          |         |         |          |         |         |          |
| jointly | 1.19‡ | 1.07, 1.32 | 1.08‡ | 1.17, 1.17 | 1.06, 1.15 | 1.09, 1.15 | 1.07, 1.07 | 1.09, 1.09 |          |          |          |          |          |          |          |          |          |
Table 3. Cont.

|                | BCG      |          | DPT      |          | Polio    |          | Measles  |          |
|----------------|----------|----------|----------|----------|----------|----------|----------|----------|
|                | Model I  | Model II | Model I  | Model II | Model I  | Model II | Model I  | Model II |
| aOR            | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      | 95% CI   | aOR      |
| Attitudes on partner violence (4) refuses to have sex |          |          |          |          |          |          |          |          |
| Yes (Ref.)     |          |          |          |          |          |          |          |          |
| No             | 0.98     | 0.98     | 0.98     | 0.98     | 0.99     | 0.99     | 1.00     | 0.92     |
| Attitudes on partner violence (5) burns food |          |          |          |          |          |          |          |          |
| Yes (Ref.)     |          |          |          |          |          |          |          |          |
| No             | 1.08     | 1.02     | 0.92     | 0.93     | 1.00     | 0.98     | 0.88     | 0.87     |
| Newspaper use  |          |          |          |          |          |          |          |          |
| Not at all (Ref.) |        |          |          |          |          |          |          |          |
| Less than once a week | 1.15 †   | 1.08     | 1.06     | 1.09 †   | 1.03     | 1.06     | 0.99     | 1.08 +   |
| At least once a week | 1.27 †   | 1.21     | 1.08     | 1.33     | 1.13 +   | 1.25     | 1.09 +   | 1.19     |
| Daily          | 2.80 +   | 1.36     | 1.02     | 0.92     | 0.90     | 0.99     | 1.43     | 0.99     |
| Radio use      |          |          |          |          |          |          |          |          |
| Not at all (Ref.) |        |          |          |          |          |          |          |          |
| Less than once a week | 1.15 †   | 1.06     | 1.25     | 1.08 †   | 1.13     | 1.14     | 0.97     | 1.17     |
| At least once a week | 1.36 *   | 1.25     | 1.52     | 1.25 *   | 1.17     | 1.16     | 1.09 +   | 1.17     |
| Daily          | 0.55 †   | 0.86     | 0.35     | 0.52     | 0.62 +   | 0.42     | 0.80     | 0.56     |
| Television use |          |          |          |          |          |          |          |          |
| Not at all (Ref.) |        |          |          |          |          |          |          |          |
| Less than once a week | 1.53 *   | 1.39     | 1.34     | 1.33 *   | 1.24     | 1.24     | 1.29     | 1.20     |
| At least once a week | 1.78 *   | 1.35     | 1.48     | 1.57 *   | 1.69     | 1.34 *   | 1.25     | 1.43     |
| Daily          | 1.86 *   | 1.36     | 1.22     | 1.17 †   | 1.08     | 1.34     | 1.58 +   | 1.77     |

BCG = bacille de Calmette-Guérin vaccine, DPT = diphtheria, pertussis, and tetanus vaccine, a = adjusted age, educational attainment, household income, location. * = p-value < 0.001, † = p-value < 0.01, ‡ = p-value < 0.05 indicates statistical significance.
4. Discussion

Our results showed that vaccination for children is significantly associated with women’s decisional authority and media use in South and Southeast Asia.

First, we found that women who had decision-making authority and were against domestic violence were more likely to have their children vaccinated. In the literature, physical abuse and domestic violence towards women are known to increase the risk of illness and death of newborn infants in developing countries of South and Southeast Asia [17,18]. Ultimately, enhancing health-related decisional authority and social status of women can act as a fundamental measure to improve maternal and child health status including vaccination [19]. Therefore, it is necessary to engage women in activities that extend rights of women and institutionalize gender equality throughout the society.

Second, media use was positively associated with vaccination of children. Newspaper and television use are known to be significantly associated with better child health such as vaccination [8,12,15,20]. This is consistent with other studies showing association between media use behaviors and mothers who have their children vaccinated [15]. This suggests that reducing communication inequalities to encourage mothers could also contribute to improvement in vaccine coverage for children in developing countries.

For East Asian mothers, decisional authority, self-efficacy, and health literacy can all increase the likelihood that they would vaccinate their children [21]. Vaccination for children can be encouraged by communication within families [22]. However, in Bangladesh and Pakistan, the important role played by mothers-in-laws has been found to be a barrier preventing their daughters-in-laws from utilizing preventive services including vaccination [23–25]. In most Asian countries including Nepal, mothers-in-laws make decisions for their daughters-in-laws, in accordance with patriarchal systems [25,26]. Women after marriage become husband’s family members and serve his parents. Although husbands can act as a support system for women to deal with their mothers-in-laws, the role of Asian men in childbirth is very limited [27,28]. Consequently, informing mothers-in-laws of the benefits of preventive healthcare services by providing them with health education is important for increase vaccine coverage rates of women in South and Southeast Asia [22,29–31].

Developing countries in South and Southeast Asia are undergoing significant changes. First, investments in improving women’s educational attainment are underway. Young educated women are more active in utilizing healthcare services as they have higher health literacy [23,32,33]. Second, efforts are being made to mitigate social inequality through economic growth. It is generally accepted that when gross national income per capita increases, life expectancy increases as well [34–36]. This is because unmet needs in health and medical services are satisfied when economy develops and household income increases [37–39]. However, current efforts to elevate women’s social status remain insufficient. When women are further empowered child health care indices will improve while infant mortality rates will decrease.

Study Limitations

First, the present study used cross-sectional data to analyze only correlation, not causation. Although data collected used random effects model to explain heterogeneity among countries, it was impossible to control qualitative heterogeneity entirely among the six nations studied. This might have created biases when using the research model to estimate coefficients. While DHS has the advantage of conducting interstate analysis of data collected through standardized questionnaires and methods, it must be noted that, when interpreting results, investigations included in the present analysis were conducted over four years (2011–2014) and only representative populations in these developing countries were selected. Second, because women who participated in investigations responded regarding their past pregnancies/childbirths, there might be recall bias in responses. In addition, because the study used a secondary data, some measures were measured indirectly (e.g., decisions about child health). Third, potential confounding variables could also affect the statistical model
of this study (e.g., fear of adverse reactions, vaccine availability, number of children/family size). Also, the prediction and use of main variables with various measurement items will increase the reliability and validity of the study in the future study. Finally, although decisions about vaccination may vary depending on the culture and traditions of each country (e.g., father’s role), this study did not incorporate these into the model.

5. Conclusions

The present study revealed that women’s decisional authority and the use of media were associated with improvements in vaccine coverage for children. Consequently, for child health care in developing countries in South and Southeast Asia, measures that can assist families and local communities in promoting women’s health decisional authority must be contemplated. Empowered women can give birth to healthy fetuses through utilization of appropriate child healthcare, leading to a population that can reproduce more healthily. This can ultimately improve economic and human capital of developing countries.

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