

2015

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[10.11648/j.ajhr.20150306.11](https://ro.ecu.edu.au/ecuworkspost2013/1712)

Originally published as: Mahara, G., Asweto, C., Kai, C., Alzain, A. M., Sebastian, A., Barr, J., ... Wang, W. (2015). Utilization of ANC and PNC services in Nepal : A multivariate analysis based on Nepal Demographic Health Survey 2001 and 2006. *American Journal of Health Research*, 3(6), 318-327.

Original article available [here](#)

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<https://ro.ecu.edu.au/ecuworkspost2013/1712>

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Utilization of ANC and PNC Services in Nepal: A Multivariate Analysis Based on Nepal Demographic Health Survey 2001 and 2006

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To cite this article:

Mahara Gehendra, Asweto Collins, Cao Kai, Alzain M. Ali, Sebastian Andrea, Barr Jill, Guo Xiuhua, Wang Wei. Utilization of ANC and PNC Services in Nepal: A Multivariate Analysis Based on Nepal Demographic Health Survey 2001 and 2006. *American Journal of Health Research*. Vol. 3, No. 6, 2015, pp. 318-327. doi: 10.11648/j.ajhr.20150306.11

Abstract: *Background:* Maternal Mortality is a public health problem in Nepal, which was highest in 1990 among the South Asian countries. Associated factors of maternal mortality are various; among them maternal health services such as antenatal (ANC) and postnatal care (PNC) services are the main. *Methods:* A multivariate secondary data analysis out based on Nepal Demographic Health Surveys 2001 and 2006. Logistic regression models was performed to compare the utilization of the ANC and PNC services, with background characteristics of women aged between 15 to 49 years old. *Results:* A total of 8913 reproductive aged groups (15-49) women were taken for analysis and the mean age was 28.59±7.040 years. Logistic regression analysis revealed that health facility delivery (AOR=1.297, 95% CI=1.135-1.481), PNC check-up at health facility (AOD=4.442, 95% CI=2.815-7.011) and PNC service with a skilled health worker (AOD=4.533, 95% CI=2.753-7.465) utilized more in 2006 compared to 2001. This study also found that highly educated women had (AOD, 95% CI=10.823-22.968) more utilized the health facility during pregnancy and (AOD, 95% CI=2.194-16.950) more likely during a PNC check-up, whereas, educated women were less (AOR=0.043, 95% CI=0.007-0.254) likely consult with a skilled professional. Similarly, antenatal care (ANC) visits (4 or more than four) and ANC visit in the first trimester were increased (95% CI=1.137-1.518) and (AOD=1.041, 95% CI=0.924-1.173) respectively. This study found that educated women, those who were living in urban areas, were more likely to use maternal health services compared to other regions. *Conclusion:* Increased in utilization of the ANC and PNC services through skilled health workers in a health facility among cohorts of educated women. However, the improvements were not equally distributed across the all regions in the country. This utilization of maternal health services is not sufficient to achieve the MDG goal. Because, health facility delivery is poor and counterpart home delivery is still high in Nepal.

Keywords: Antenatal Care and Postnatal Care, Maternal Health Service, Nepal

1. Introduction

The complications during pregnancy and childbirth are the main causes of disability and death of women, according to World Health Organization (WHO) [1]. About 800 women die per day around the globe due to pregnancy-related causes

and complications such as severe bleeding after childbirth, infection, hypertensive disorder and unsafe abortion, and all of these complications are preventable[1, 2]. Among them, 99% of the deaths occur in developing countries [1].

Maternal mortality is still a critical public health concern, since there are a huge number of casualties arising globally [3]. Almost half of maternal deaths take place in developing

countries due to combined consequences of hemorrhage and hypertension along with other direct and indirect causes [1]. Such deaths could be avoided in developing countries, if proper health services and health resources are made available. Maternal death occurs mainly in low and middle-income countries, where the population of skilled professionals as well as quality health services is low [4]. A WHO report showed that the gap of maternal death between developed and underdeveloped countries, as well as urban and rural area is varies. After the multiple worldwide efforts of health services and medical interventions, maternal mortality ratio (MMR) has been reduced in the developing countries, which are near to achieve the millennium development goal (MDG-5)[1]. However, the situation has not been improved yet, particularly in Sub-Saharan Africa, South Asia, and Oceania [3]. It's annually reducing rates is only 3.1% globally, according to the trend report of MMR of WHO[1]. Nepal had one of the highest (850 per 100,000 live births) MMR among South Asian countries in 1990[5]. After implementing the Second Long Term Health Plan (SLTHP-1997-2017), the Government of Nepal started to provide essential health service and medical interventions to all levels, and then MMR has been reduced 281/100,000 per live birth in 2006[5], which was a great achievement for the nation. Nepal bagged the Millennium Development Award in 2010 for recognition of its achievement [6].

Previous studies [7-9] showed that the ANC is the key factor for improving the maternal health, which also can help to reduce the MMR [10]. In addition, the ANC is the determinant factor of safe delivery as well [11]. The United Nations (UN) and WHO sanctioned a recommendation for pregnant women, that women must visit one or more times to the antenatal clinic with skilled health workers to ensure the condition of the child and the mother during pregnancy[12]. Furthermore, four antenatal visits have recommended by WHO during pregnancy, and first antenatal visit should be in the first trimester of pregnancy [1]. Similarly, NFHS (Nepal Family Health Survey) [13] and NDHS (Nepal Demographic Health Survey) [3,14] data showed that the percentage (more than 50% in rural areas of Nepal) of women has increased with at least one antenatal care visit between 1996 to 2006 in Nepal. The proportion of women who visited at least four times antenatal care also have increased by 20% in 2006 NDHS[6] and this enchantment is showing that it is a highly significant improvement in the country. However, the number of women who were receiving recommended (WHO recommended four ANC visits is must) antenatal care visits was only 29% in Nepal [6]. Therefore, this study focused on associated factors to timing of 1st ANC visits (1st trimester) and four or more ANC visits of in 2006.

Postnatal period is a very critical period for every woman. Immediately after delivery, most of the women are not able to visit the health facility to get the PNC service due to the geographical condition and lack of transportation facility and lack of health facility nearby home [1]. However, if the women give birth in the hospital, they can have more possibilities to receive postnatal care service before

discharged from the hospital. A key maternal mortality study stated that more than half of the maternal deaths take place during the postpartum period and that the majority postpartum death happened in developing countries as like Nepal [15, 16]. The condition of postnatal care is very poor in Nepal, where the facility of PNC service is uncommon and the quality of available service is poor and unreliable [12]. A descriptive cross-sectional study conducted in the rural part of Nepal[17]reported that 34% women getting PNC service and among them only 19% found less than one in five women who received postnatal care within 24 hours after childbirth. The study also urged that the main obstacle to the utilization of postnatal care was a lack of awareness [17].

The objective of this study was to compare and contrast the utilization of the ANC and PNC services, with background characteristics of women aged between 15 to 49 years based on Nepal Demographic Health Surveys (NDHS), 2001 and 2006.

2. Methods

2.1. Data Sources

This was a comparative secondary data analysis based on Nepal Demographic Health Surveys (NDHS) 2001 and 2006. The NDHS is a national representative survey of (women of reproductive age between 15 to 49 years) Nepal supported by the Global Demographic Health Survey Program (DHS). The program aimed to produce the latest and reliable baseline information on fertility, family planning, infant, and child mortality, maternal and child health along with nutrition and knowledge of HIV/AIDS. These surveys were carried out through the aegis of Family Health Division, Department of Health Services, and Ministry of Health and Population Nepal, and the technical support was granted by ORC Macro and financial support by USAID and conducted by New ERA Pvt. Co. Ltd (local research organization) Nepal. Permission was sought from the Demographic Health Survey (DHS) to use the data sets. A total of 10793 of 2006 and 8726 of 2001 households with ever married women (15-49 years) were taken for interview. For this analysis, we included only 4182 women from 2001 and 4730 women from 2006 datasets, who had given birth within the five years preceding the survey. This survey is conducted in each five years by Global Demographic Health Survey Program (DHS).

Description of the survey:

The NDHS survey used information on population and health issues and guidelines from the censuses (Centre Bureau of Statistics Nepal) [18]. For the administrative purpose the country has divided into three ecological regions (mountain, hill, terai), five development regions (eastern, central, western, mid-western, far-western). Likewise, Nepal has 14 zones and 75 administrative districts and these districts are further divided by village development communities (VDCs) and municipalities, while each village development committee is divided into wards. The primary

sampling unit (PSU) of NDHS was a ward, sub ward and group of wards in rural areas and sub wards in urban areas. The sampling frame was representative of 96 percent of the non-institutional population. The sample for this survey was based on a two stage, stratified sampling of households. At the first stage using systematic sampling with proportional to size and at the second stage systematic samples of household per PSU in estimate average in urban and estimate average in rural areas were selected in all regions by using sampling frame, in order to provide statistically reliable estimates of key demographic and health variables. The total sample was weighted and a final procedure was applied to provide estimates for the different domains, and in the urban and rural areas of the country as a whole [5, 14].

2.2. Variables

2.2.1. Socio-Demographic Variables

Socio-demographic variables used for this study were: age (15-19, 20-24, 25- 29, 30-34, 35-39, 40-40 and 45-49 years) birth order (1-4, 5-10) place of residence (rural, urban), ecological region (mountain, hill, terai), education level (no education, primary, secondary, higher), partner's educational level (no education, primary, secondary, higher); occupation (farmer, non- farmer, not working) and partner's occupation (farmer, non- farmer, not working).

2.2.2. ANC Visits and Initiation

ANC visits measured with 1 to 36 times during the whole period of pregnancy. For this study, we categorized of respondent into i) less than 4 ANC visits ii) at least 4 ANC visits and iii) no response. Likewise, imitations for ANC visits measured with 1 month to 10 months. For data analysis, the responses were categorized as: i) 1st trimester (1 to 3 months) and ii) more than 1st trimester (more than three months).

2.2.3. Place of Delivery

Place of delivery was measured with the variables as: home (respondent's home), public sector (Govt hospital, govt. Health center, govt. Health Post, other public), private sector (Private Hospital/clinic, UNM/Red Cross Hospital, Other NGO, private medical college, medical hall). In this study, responses were categorized as: i) home delivery and ii) health facility delivery, which include all health institutional deliveries (govt and all private health sectors).

2.2.4. Post Delivery Check

Post-delivery check-up was measured with the variables: health professional like: i) doctor, ii) nurse/midwife, iii) nurse midwife, iv) health assistant/auxiliary health worker; v) MCH worker, vi) village health worker (VHW); vii) visits to traditional birth attendants, viii) visit to another person (relatives or friends), and ix) traditional birth attendant. In this study, the responses were categorized into i) skilled personnel which include, health professionals, nurses and health workers ii) non skilled personnel, which included MCH, VHW, traditional untrained attendant, FCHW, relatives or friends.

2.3. Statistical Analysis

Statistical analysis performed using Microsoft Excel 2007 and then SPSS V-20. All two years (2001 and 2006) datasets merged into a single dataset to make easy for further analysis. Socio-demographic factors of women age between 15-49 years tabulated for each survey year using the descriptive and crosstab analysis in SPSS. In order to make easy to fit the logistic model, complex type of dependent variables re-categorized into binary categories such as: PNC check-up by skilled or non- skilled, delivery place at a health facility or home, PNC check-up place at a health facility or home and ANC visits, more than 4 times or less than 4 visits and ANC timing at 1st trimester or after 1 st trimester.

Adjusted Odds Ratio (AOR) and its 95% confidence interval (CI) were calculated to measure the strength of the association between socio-demographic factors and ANC services and PNC services' factors. First, logistic regression model (I) was conducted among women using the ANC service (dependent variables like; ANC Visits 4+ and ANC Timing) with background characters (independent variables) and then Adjusted Odds Ratio (OR) at 95% confidence intervals was calculated using binary logistic regression analysis. Likewise, women's delivery services (dependent variables; PNC check-up=by health professional (skilled) or non-skilled, delivery place= health facility or home, PNC check-up place=a health facility or home) with the background characters calculated using binary logistic regression analysis in the model (II). A P-value of less than 0.05 was considered statistically significant. If the estimated Adjusted Odd Ratio (AOR) is >1 the likelihood of use of maternal health services is higher relative to the reference category. If the estimated Adjusted Odd Ratio (AOR) is <1, then the probability of use of maternal health care services is lower relative to the reference category.

3. Results

A total of 8913 household NDHS surveys was included in the data analysis 2001 (N=4182) and 2006 (N=4731). Among them, 32.9% of women were in the age group 21 to 25 years, while, 26.3% were in the age group 25 to 30 years. In addition, 12.5% of the women were in their teen age (15-20) years (table 1).

Table no 2 shows that the percentage of health services variables such as: timing of the ANC, ANC visits, prenatal checked up, PNC checked up, place of delivery and assisted during delivery. A number of ANC visits along with the timing of the ANC visit in the first trimester have increased in 2006. Likewise, four or more than four times ANC visits also increased by 29.7% to 39.9% in 2006. Similarly, ANC checked up with skilled workers like: doctor, nurse/midwife, health worker has improved, likewise, PNC checked up with skilled person has also increased, whereas PNC check up with a traditional birth attendant has remarkable decreased from 63.8% to 11.2% in 2006. From the table 2 and Figure 1, the health facility delivery has slightly improved and home

delivery has slightly decreased. However, home delivery is still very high (73.8%) in the country (table 2).

Table 1. Frequency of Socio-Demographic Variables of Respondents.

| Year | 2001 (n=4182) | | 2006 (n=4731) | |
|--------------------------|---------------|----------------|---------------|----------------|
| | Frequency | Percentage (%) | Frequency | Percentage (%) |
| Age 15-20 | 529 | 12.6 | 584 | 12.3 |
| 21-25 | 1457 | 34.8 | 1474 | 31.2 |
| 26-30 | 1119 | 26.8 | 1225 | 25.9 |
| 31-35 | 578 | 13.8 | 777 | 16.4 |
| 36+ | 499 | 11.9 | 671 | 14.2 |
| Age at First Child Birth | | | | |
| <15 | 208 | 5.0 | 232 | 4.9 |
| 16-20 | 2790 | 66.7 | 3178 | 67.2 |
| 21-24 | 932 | 22.3 | 1043 | 22.0 |
| 25+ | 252 | 6.0 | 278 | 5.8 |
| Place of residence | | | | |
| Rural | 995 | 23.8 | 466 | 9.8 |
| Urban | 3187 | 76.2 | 4265 | 90.2 |
| Ecological region | | | | |
| Mountain | 607 | 14.5 | 710 | 15.0 |
| Hill | 1619 | 38.7 | 1762 | 37.2 |
| Terai | 1956 | 46.8 | 2259 | 47.7 |
| Partners Education level | | | | |
| No education | 1586 | 34.2 | 953 | 22.9 |
| Primary | 1190 | 25.6 | 1175 | 28.2 |
| Secondary | 1583 | 34.1 | 1675 | 40.2 |
| Higher | 285 | 6.1 | 264 | 8.7 |
| Resp. Education level | | | | |
| No education | 3423 | 72.4 | 2455 | 58.7 |
| Primary | 676 | 14.3 | 745 | 17.8 |
| Secondary | 577 | 12.2 | 856 | 20.5 |
| Higher | 55 | 1.2 | 126 | 3.0 |
| Respondent's occupation | | | | |
| No work | 684 | 14.5 | 750 | 17.9 |
| Farmer | 3745 | 79.2 | 3067 | 73.3 |
| Non farmer | 300 | 6.3 | 365 | 8.7 |

Mean age of the respondent is 28.59 ± 7.040 years, minimum age 15 and maximum age being 49 years.

Table 2. Percentage of ANC and PNC Variables.

| Timing of ANC | Percentage (%) | | ANC Visits | Percentage (%) | |
|---------------------------|----------------|-------|-----------------------------|----------------|-------|
| | 2001 | 2006 | | 2001 | 2006 |
| 1 st trimester | 33.7% | 37.0% | 1 | 16.2% | 11.8% |
| 2 nd trimester | 52.9% | 53.3% | 2-3 | 54.1% | 48.3% |
| 3 rd trimester | 13.4% | 9.7% | 4+ | 29.7% | 39.9% |
| Delivery Place | 2001 | 2006 | Assisted during Delivery | 2001 | 2006 |
| Home | 79.9% | 73.8% | Doctor | 8.8% | 10.3% |
| Health Facilities | 20.1% | 26.2% | Nurse/Midwife | 10.3% | 19.2% |
| | | | Health worker | 13.5% | 19.3% |
| | | | Traditional Birth Attendant | 22.5% | 16.3% |

Figure 1 shows that the percentage of service provider during pregnancy and in the delivery. The proportion of women who had utilized maternal health services from skilled health workers had increased in 2006 compared to 2001. However, its improvement ratio is low.

Table 3 shows that in 2006, women were more (AOR=1.314, 95% CI=1.137-1.518) likely visited more than

four ANC visits compared to 2001 and it was 2.119 times (95% CI=1.795-2.502) more likely to have had more than 4 ANC visits in urban areas. Likewise, the ANC timing (1st trimester) was also increased (AOR=1.041, 95% CI=0.924-1.173) over time and more (AOR=1.307, 95% CI=1.127-1.516) likelihood visit the ANC clinic in the first trimester in urban area compared to rural in 2006. However, there was found an inverse relationship between women's age and likelihood of ANC visits shown in table 3.

Similarly, an increase in the education level increases the ANC visits during pregnancy. A woman who was highest qualification were 16.409 times (95% CI=11.560-23.293) more visits more than 4 ANC clinic during pregnancy, while those with primary level education were more (AOR=2.727, 95% CI=2.249-3.306) likely and who had at least secondary level education were more (AOR=5.232, 95% CI=4.384-6.245) likely to utilize ANC clinic compare to uneducated women. Likewise, it was found a statistically significant relationship between women's levels of education with ANC timing such as: who were higher education they have had 4.2 times (AOR=4.240, 95% CI=0.170-0.338) more chance to get the ANC service at first trimester (table 3). This study found that farming women were more (AOR=1.588, 95% CI=1.359-1.854) likely visit ANC clinic in 1st trimester than unemployed women, while it was found an inverse relationship with more than four ANC visits in 2006.

Table 4 and figure 2 shows the utilization of PNC service by women in the year 2006, women were 1.29 times (AOR=1.297, 95% CI=1.135-1.481) more likely to deliver in health facility, 4.44 times (AOR=4.442, 95% CI=2.815-7.011) more PNC checks up at health facility and 4.53 times (AOR=4.533, 95% CI=2.753-7.465) more likely PNC check up with the skilled health worker. Our study shows that likelihood of health facility delivery decreases with the increase in women's age. Women of age group 21-25 were twice more likely to have PNC in the health facility compared to women aged 15-20, while receiving PNC service with skilled professional did not show any significance.

Likewise, those women were residing in urban area were more likely to utilize PNC services at the health facility. In addition, whom residing in hilly area were more likely to deliver at health facility compared to the mountain (AOR=1.321, 95% CI=1.050-1.661). The data showed that improvement to the education level of women also increased the use of health facility during delivery and postnatal care period. A woman who had higher education those women have 15 times (AOR=15.767, 95% CI=10.823-22.968) more chance to get health facility during delivery likewise, those with secondary level of education were 5.2 times (AOR=5.202, 95% CI=4.431-6.108) more likely and Primary level of educated women were 1.8 times (AOR=1.851, 95% CI= 1.543-2.220) more likely to deliver in health facility compared to those who had no education (illiterate). Furthermore, whose profession was farming those were more (AOR=1.019, 95% CI=0.816-1.274) likely to deliver in health facility compared to unemployed women (Table 4).

This study shows that in 2006 that women were 4.44 times

(AOR=4.442, 95% CI=2.815-7.011) more likely used PNC services in health facility with skilled health professional (AOR=4.533, 95% CI=2.753-7.465). Women age between 21-25 years were 2.3 times (AOR=2.386, 95% CI=1.220-4.669) more likely to have utilized PNC service in health facility compare to 15-20 years. Likewise, women were more likely utilized PNC service in health facility (AOR=2.783, 95% CI=1.620-4.781) with skilled worker (AOR= 10.502,

95% CI=5.387-20.477) in urban compared to rural area, while women who lived in terai region have had 8.394 times (AOR=8.394, 95% CI=3.318-21.233) more likely used PNC service with skilled professional compared to mountain region's women. However, Terai region's women had less likelihood utilized PNC service in health facility (AOR=0.359, 95% CI=0.165-0.782).

Table 3. Factors influencing the utilize the ANC services (logistic regression model-I).

| Variables | ANC Visits Adjusted OR (95% CI) | ANC Timing Adjusted OR (95% CI) |
|-------------------------|---------------------------------|---------------------------------|
| Year | | |
| 2001 | 1 | 1 |
| 2006 | 1.314 (1.137-1.518) *** | 1.041 (0.924-1.173) |
| Age Group | | |
| 15-20 | 1 | 1 |
| 21-25 | 0.948 (0.771-1.165) | 1.006 (0.842-1.201) |
| 26-30 | 0.924 (0.740-1.153) | 0.971 (0.803-1.173) |
| 31-35 | 0.667 (0.501-0.889) *** | 0.911 (0.726-1.143) |
| 36+ | 0.475 (0.329-0.685) *** | 0.963 (0.738-1.256) |
| Place of residence | | |
| Rural | 1 | 1 |
| Urban | 2.119 (1.795-2.502) *** | 1.307 (1.127-1.516) |
| Ecological region | | |
| Mountain | 1 | 1 |
| Hill | 1.240 (0.970-1.585) | 1.048 (0.858-1.279) |
| Terai | 1.082 (0.845-1.385) | 1.284 (1.056-1.561) |
| Education level | | |
| No education | 1 | 1 |
| Primary | 2.727 (2.249-3.306) *** | 1.757 (0.647-2.887) |
| Secondary | 5.232 (4.384-6.245) *** | 2.485 (1.418-4.162) *** |
| Higher | 16.409 (11.560-23.293) *** | 4.240 (2.170-6.338) *** |
| Respondent's occupation | | |
| No work | 1 | 1 |
| Farmer | 0.546 (0.455-0.655) *** | 1.588 (1.359-1.854) *** |
| Non farmer | 0.845 (0.665-1.073) | 1.167 (0.938 -1.451) |

Table 4. Factors influencing the utilize the PNC services (logistic regression model-II).

| Variables | Delivery (HF) Adjusted OR (95% CI) | PNC Place (HF) Adjusted OR (95% CI) | PNC (Skilled Professional) Adjusted OR (95% CI) |
|-------------------------|------------------------------------|-------------------------------------|---|
| Year | | | |
| 2001 | 1.000 | 1 | 1 |
| 2006 | 1.297 (1.135-1.481) *** | 4.442 (2.815-7.011) *** | 4.533 (2.753-7.465) *** |
| Age Group | | | |
| 15-20 | 1. | 1 | 1 |
| 21-25 | 0.735 (0.605-0.893) *** | 2.386 (1.220-4.669) *** | 0.623 (0.299-1.298) |
| 26-30 | 0.774 (0.628-0.953) *** | 1.343 (0.640-2.819) | 1.014 (0.463-2.222) |
| 31-35 | 0.779 (0.605-1.003) *** | 1.540 (0.632-3.756) | 0.532 (0.211-1.343) |
| 36+ | 0.838 (0.635-1.107) | 1.879 (0.763-4.630) | 0.599 (0.224-1.601) |
| Place of residence | | | |
| Urban | 1 | 1 | 1 |
| Rural | 2.921 (2.508-3.402) *** | 2.783 (1.620-4.781) | 10.502 (5.387-20.477) *** |
| Ecological region | | | |
| Mountain | 1 | 1 | 1 |
| Hill | 1.321 (1.050-1.661) *** | 2.146 (0.969-4.754) | 0.925 (0.302-2.838) |
| Terai | 1.229 (0.976-1.546) | 0.359 (0.165-0.782) *** | 8.394 (3.318-21.233) *** |
| Education level | | | |
| No education | 1 | 1 | 1 |
| Primary | 1.851 (1.543-2.220) *** | 2.940 (1.702-5.078) *** | 0.338 (0.179-0.638) *** |
| Secondary | 5.202 (4.431-6.108) *** | 2.998 (1.745-5.151) *** | 0.139 (0.74-0.260) *** |
| Higher | 15.767 (10.823-22.968) *** | 6.098 (2.194-16.950) *** | 0.043 (0.007-0.254) *** |
| Respondent's occupation | | | |
| No work | 1 | 1 | 1 |
| Farmer | 1.019 (816-1.274) | 1.505 (0.907-2.497) | 1.159 (0.685-1.962) |
| Non farmer | 0.465 (0.378-0.571) *** | 1.592 (0.721-3.513) | 0.172 (0.055-0.542) *** |

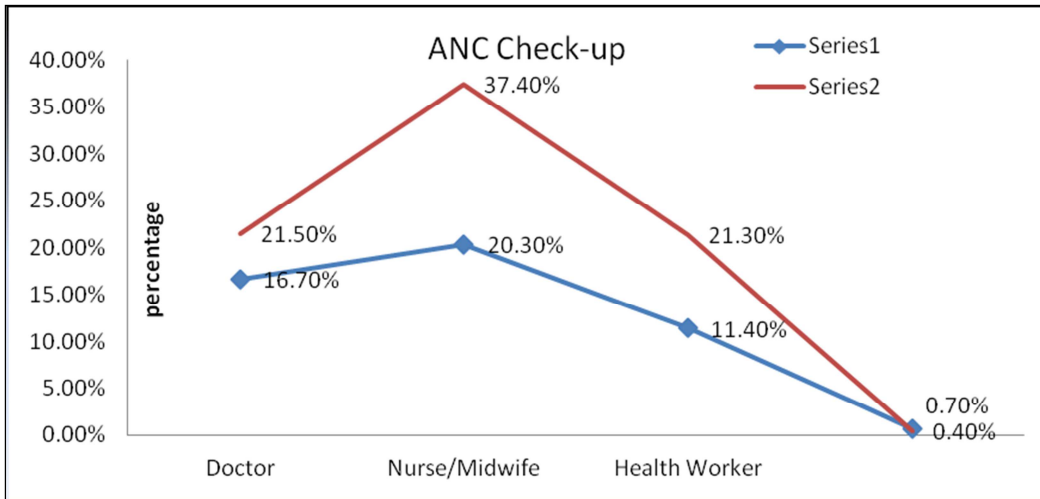


Figure 1. Percentages of ANC Check up by women in preceding time, whereas series 1 means 2001 and series 2 means 2006.

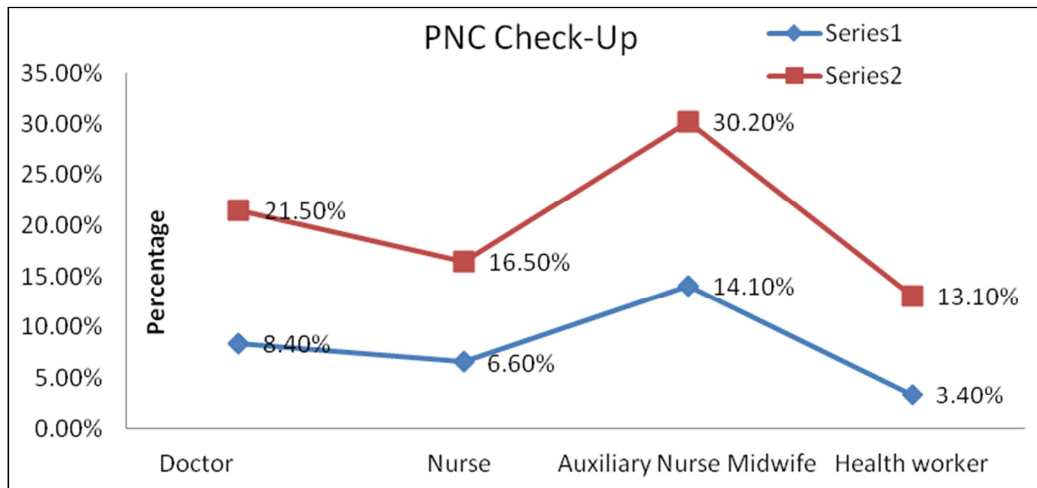


Figure 2. Percentages of PNC Check up by women in preceding time, whereas series 1 means 2001 and series 2 means 2006.

Table 3 shows that an increase in the education level of women, the utilization of PNC service and delivery in health facility also increased over the period. A woman who had higher education were 6 times (AOR=6.098, 95% CI=2.194-16.950) more chance to get PNC service in health facility than uneducated women, while increase the education levels along with the job (non-farming) were found an inverse relationship with PNC service utilization from the skilled professional as shown in table 4.

4. Discussion

The main aim of this study was to compare and contrast the utilization of the ANC and PNC service with demographic characteristics of women in Nepal, based on the Nepal Demographic Health survey 2001 and 2006. This study revealed that the maternal health services have improved in Nepal, in the presence of skilled professionals during pregnancy. Likewise, delivery in health facility with skilled personnel had increased compared to 2001. However, home delivery found still high in this study (Table 2).

This study investigated the link between the timing of the

first antenatal clinic visit and socio-demographic factors. The ANC has been considered as a key entry point for pregnant women to get a broad range of health promotion and disease prevention services [19]. This study found that the ANC timing at first trimester was increased by 1.04 times in 2006. Previous study of Shrestha *et al.*[20] also found that the ANC visit in the first trimester was improved by 1.3 times in the first trimester period. Where who have had higher qualification, they have had a more chance to get ANC service in the first trimester, because educated women’s have more likely decision power on health related issues rather than uneducated women[21], so they may visit the ANC clinic in early three months of pregnancy than less educated women.

Urban area and Terai region are usually characterized by better use of maternal health services, being their infrastructural advantages compared to rural or mountain region. Further analysis of NDHS reports (Pant *et al.*, 2008) [22] and Study of Shrestha *et al.* [20] urged that ANC timing at first trimester has increased over the study period in the country. However, this study again explained that ANC service in the first trimester was less likely utilized by the

women who residing in terai region [20]. This could be due to easily available health service in the Terai region compared to hill and mountain region and they can visit anytime to the health facility, so they might be negligent to visit in the early phase of pregnancy. ANC service is available at free of cost in Nepal [23], therefore all places (rural or urban and hill or mountain or terai) region's women have an almost equal opportunity of getting the health services. Likewise, our study found that ANC service in all regions in the country was increased but not found statistically significant.

This study established that ANC visits was increased than 2006 (table 2, Figure 1), whereas the study of Shrestha *et al* [20], urged that it was increased by four times in the study period. Similarly, ANC visits were 2.1 times more likely utilized in urban areas (table 3) while the study of Shrestha *et al* [20] found that 1.56 times more likely enhancement in urban areas. Further analysis of NDHS report stated that at least four ANC visit has increased by 20 percent throughout Nepal [22]. The study of Hussein *et al* [23], reported that the number of ANC visits has increased in Nepal which were similar finding with the studies of Simkhada *et al* [24] Acharya *et al* [25], and. However, previous studies of Tuladhar *et al* [26] reported that the majority (73.7%) of women had visited ANC clinic only once and among them less than half visited four times or more times. Likewise, the ANC utilization is still lower than other South Asian countries as like; Sri Lanka (100%), India (73%), Bangladesh (49%) compared to 44% Nepal [27]. Importantly, WHO recommended that four ANC visit is necessary to have a normal delivery. In fact, antenatal care is necessary and which is a way to know the risk and complications of women and her child in advance [28]. Additionally, ANC is an important time for a woman to establish a relationship with a health care provider and a way to deliver key messages to health worker about women's health problems especially relating to the upcoming birth according to UN amended of MDG5. Previous studies of Ogununde *et al* [11] and Simkhada *et al* [10] stated that the ANC check-up is a determining factor for safe delivery too, which is also supported by MOHP [29].

This study established that who have had a higher education, they have had more chance to get ANC visits and even who have had at least secondary level of education they would have five times more likely to utilize ANC visits compared to no education (illiterate) women. Previous study of Shrestha *et al* [20], Simkhada *et al* 2006 [24], Acharya *et al* [25], Hussien *et al* [23] also revealed the similar explanation that educated women were more likely utilize ANC visit compare to uneducated women. In fact, education promotes new values and attitudes towards the modern health service which may also help to provide a feeling of self-worth and increase self-confidence and that is an important to bring changes in health related behavior [30]. Likewise, Government of Nepal had a specific target to achieve the MDG goal which had to be increase the percentage of women making four or more ANC visits by 80% in 2015 (UNDP) [31]. An increase in the number of educational

institutions in the country and provide the free educational program in educational institutions help to increase the social status as well as empower the women Simkhada *et al*, 2006 [24], Sharma *et al*, 2007 [21], Shrestha *et al*, 2014 [20], (CBS, 2011) [19] eventually, they may utilize the maternal health service so far.

Utilization of postnatal services had increased from 2001 to 2006 in Nepal (Table 2, Figure 2). This study established that 4.4 times more likely utilized PNC service in a health facility and PNC checkup 4.5 times, more likely getting health services with skilled health workers over the period. The previous study of Dhakal, *et al* [17] also stated that utilization of PNC service increased by 34% and other several studies such as: Simkhada, *et al* [24], Khanal *et al* [32], Hussien *et al* [23] also stated that PNC checked up has increased in over time. Similarly, there was 2.7 times more likely utilized PNC service at health facility by whom residing in urban areas, and 10.5 times more likely utilized PNC service with skilled health workers by urban area's women. Previous study of Khanal *et al* [32] also stated that 3.9 times more likely utilized PNC service at a health facility in Nepal. This study found that the improvement of utilized PNC services is not equal in the country, which is also supported by the study of Hussien *et al* [23]. Furthermore, utilization of PNC services in Nepal is still poor suggested by Neupane and Doku, (2013) [33]. The main barriers to utilize the PNC services were lack of awareness about maternal health, distance to health facility, lack of trained health professional and lack of health facility in a particular village concluded by Simkhada, *et al* [24] and Dhakal, *et al* [17]. This study confirmed that education was a key factor of utilization of delivery and PNC check-up at the health facility. Women's education with maternal health services was found strong positive relationship (more likelihood), which is a similar finding with Sharma, *et al* [21]. It could be suggested that educated women have a greater decision making power on health associated issues [24]. It has argued that educated women are more likely to understand the benefit of using the maternal health care service and that kind of education may enhance female autonomy, thereby enabling them to make the decisions about their own health [34]. They can also have the ability and willingness to travel and be more confident in dealing with their problem with health worker [24]. Though if women have only a primary level education, they can more likely to utilize ANC and PNC service [35]. More explanation of this statement is, primary level educated women have a more chance to get married in early age (teenage) and also more chance to have a child in early age. Therefore, they can visit frequently in health facility, then educated women, because educated women may have a job or business or still studying that means they can be busy with the task, so they may not have more time to visit a health facility rather than less education.

Interesting findings of this study were, employed women were less likely to utilize the PNC services with skilled worker. In fact, it has expected that employment and the capacity to earn money empower the women and encourage

them to use the maternal health services [21, 36]. Similarly, employed women can also have greater exposure and access to grasp the important information and knowledge about maternal health [35]. It may not necessarily be utilizing health services because unemployment or farming women may utilize the more PNC service than employed women. In developing countries, women also work similar to men to save the life and reduced poverty and resulting that, it would be likely to have an inverse impact on getting of maternal health services [21, 37].

This study revealed that health facility delivery was increased compared to 2001 (table 2). However, the proportion of improvement is not sufficient to achieve the MDG goal. Even though, 1.29 times more likely conducted delivery at health facility in 2006, while it delivered more in an urban area to have had higher education. Previous study of Shrestha *et al.*, [30] stated that 2.63 times more delivered in a health facility, whereas, 2.62 times more likely delivered in urban areas with educated women compared to illiterate women. Our study established that employed women were less delivered in health facilities, which is a similar finding with Shrestha *et al* [20]. It may be due to the busy schedule of them who have employed. This study found that still 73.8% delivery takes place at home and only 26% to give birth at the health facility in 2006. Home delivery is still highest in the country. A visit to the skilled professional or health facility is compulsory, if the birth takes place at home, and at least two postnatal visits (first 24 hours of delivery and the second within 3 days of skilled professional) have recommended by both WHO and UNICEF to save the life of women and reduce the child and maternal complication and death [1]. There are many barriers to give birth at home. Study of Pant *et al* [22], stated that 73% women still believed that delivery at health facility is not necessary, 17% women said it is custom of our community and 10% women said the cost is high. Likewise, transportation, distance of health facility, geographic distribution, less available maternal health service, less available female provider and trust upon health worker [24, 17, 20] are the barrier to give birth at a health facility and among them, the main barrier to utilized postnatal care service is the lack of awareness urged by Dhakal *et al* [17].

There were several strengths and limitations in our study. We used two national survey data and relatively big sample size with high response rate (more than 95%) [5,14]. The demographic and health survey is an internationally validated and nationally adapted survey. Therefore, our findings are generalizable to the whole country. This study has provided the factors related to utilization of the ANC and PNC services with some demographic factors. Nevertheless, the current study has several limitations. It was based on secondary data analysis; therefore, we could not include some affecting factors of utilization of maternal health services such as; age at first child, prenatal care, assisted during delivery, wealth index, decision power at home, due to the unavailable similar nature of variables in both years. However, the findings of our study has illustrated by the table and figure, showing the proportion of services utilized by women in the study period.

5. Conclusion

Utilization of antenatal care and postnatal care services in health facility with skilled professional had increased over the study period. However, the level of improvement is still low (home delivery is still high) and even this enhancement has not been equally distributed to the all areas. Therefore, there is a need to increase utilization of the maternal health services, increase the health facilities with proper equipment's, improve the quality of health services with the skilled professionals and provide essential maternal health education to all women, which should be focused more in rural, hill and mountain area rather than urban or Terai region.

Recommendations

Make a healthy public policy, implement, and apply it properly. Access the roads and transportation in rural, hill and mountain areas. To make aware to women for more utilize the existing health services. Increase the quality health services with proper instruments. Provide the essential training to health workers who actually work in village or rural area. Disseminate the health message through the mass media, which is a more reliable and a cheap way in underdeveloped countries. Provide behaviour change training to women through health education. Special program needed to increase the education of women, especially in rural and geographically inaccessible areas. Involve the women in each health program at the community level. Reduce the health inequality in the health sector.

Author Contribution

Conceived and designed the research: GM JB. Performed the analysis the data: GM AC MA CK. Wrote the manuscript: GM JB. Contributed research idea and edited the manuscript: GM WW XW JB AS.

Acknowledgement

The authors would like to pay sincere acknowledgement to Dr. Denise, Chris Lyle, Prof. Dr. Padam Simphada (Sheffield University, UK), Mr. Surya-Indira Tiwari, Dr. Dev Raj, Mr. Kiran Shrestha (Aberdeen University, UK), Mr. Bhagirath Yogi (BBC World Service, UK, London), Ms. Ranjana Dhakal (Novel Medical College, Biratnagar, Nepal) and Gopal Khadka (University of Wolverhampton, United Kingdom for invaluable instructions, suggestions, amiable encouragement and insightful guidance. We are also grateful to Demographic Health Survey (DHS) for permission granted to use the original data set.

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