

# External Environment, Enabling Factors and Predisposing Characteristics of Fully Immunised Children in Nepal

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## ABSTRACT

**Introduction:** Immunisation is a cost-effective public health intervention worldwide responsible for the reduction of infant and child morbidity and mortality. Full immunisation is a state of obtaining all vaccination according to the Immunisation schedule of Nepal.

**Methods:** The secondary data of Nepal was downloaded from the DHS Program. A total of 1709 children aged 16-23 months were analysed for descriptive statistics. All the analyses were weighted by its sampling weight. The full immunisation status indicates those who completed 1 dose of BCG, 3 doses of Polio, 3 doses of DPT and 1 dose of Measles. The independent variables are further subdivided into enabling, predisposing and external environmental factors.

**Results:** Over half of children (52.6%) were from Terai, nearly a quarter (23.0%) from province 2. More males (53.5%) and the majority of (86.1%) children with birth order one to three were immunised. Mother aged < 20 years (62%), working father (96.1%), working mother (59.7%), educated father (87.3%) and educated mother (70.7%) had children with complete immunisation. Non-smoker mother (94.6%) had fully immunised children. Nearly three quarters (73.5%) from a middle and rich family, those with PNC within 3 days (35.9%), delivered at a health facility (64.2%), and had PNC check from the skilled provider (12.1%) had completely immunised their children.

**Conclusions:** Significant differences based on external environment, enabling factors and predisposing factors for full immunisation status was observed. Specific interventions based on these factors are recommended.

**Key Words:** children; immunisation; mothers; Nepal; vaccine-preventable diseases



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## INTRODUCTION

Immunisation is responsible for the reduction of children's death due to vaccine-preventable diseases (VPD). Since the twentieth century an estimated two to three million global children's deaths are prevented each year by immunisation.<sup>1</sup> People from developing countries are the main sufferers from VPD where high coverage of immunisation can lead to protection.<sup>2</sup> Therefore, it is recommended to receive all the required vaccinations as per the National Immunisation schedule (NIP).

Immunisation is one of the highest priority programs in Nepal. The interim constitution of Nepal 2006 and the constitution of Nepal 2015 considers health care as the fundamental right of the people. Immunisation act 2072 also states that every child has the right to get quality vaccines.<sup>3</sup> Government of Nepal, Ministry of Health and Population has recommended at least seven contact visits - at birth, 6, 10, 14 weeks, and 9, 12, 15 months in the health centre to receive eleven types of antigen as per the NIP schedule.<sup>4</sup> The services are delivered by the government, public and some private service providers in Nepal.<sup>3</sup>

Every year, over a half million (6, 30,000) children receive free immunisation service through various routine, fixed and outreach immunisation sessions in Nepal. Comprehensive Multi-Year Plan (2011-2016) has aimed to have 90 percent coverage of all antigen by 2016.<sup>5</sup> In September 2000, the United Nations adopted the Millennium Development Goals (MDG) - an international time-bound commitment to reduce poverty and advance other social development targets by 2015. Nepal is one of the member nations of the UN that has committed to these goals. Nepal has met the goal of reducing the child mortality as per MDG goal 4 and 5.<sup>6</sup> An analysis of Demographic Health Survey (DHS) and Multiple Indicator Cluster Survey (MICS) has indicated that the significant contribution on this progress of immunisation is due to the programs targeted to disadvantaged people of the country.<sup>7</sup>

The MDG progress report emphasise on addressing the inequalities on a number of the population

segment.<sup>6</sup> Overall findings suggest that though Nepal met the goals for reducing child mortality, there are still unfinished agendas on child health. To fulfil the unfinished agendas of child health, Nepal has committed to sustainable development goals.<sup>6</sup> Nepal aims to become fully immunised country by 2021<sup>3</sup> and it aims to reduce under-five mortality by 73% and infant mortality by 68%.<sup>8</sup>

Therefore, the present study aims to explore the external environment, enabling factors and predisposing factors of full immunisation. Exploring the gaps in immunisation service utilisation would have policy, academic, as well as public health significance.

## METHODS

Nepal Demographic and Health Survey (NDHS) is a nationally representative survey conducted in Nepal. In this study, an exploratory study design was used to perform secondary data analysis of NDHS 2016 from April 2018 to January 2019. The women aged 14 - 49 years who were either the permanent residents of the selected household or visitors who stayed in the household the previous night of the survey were considered eligible for an interview by NDHS.<sup>9</sup> The sample was not self-weighted due to non-proportionate sample allocation. Therefore, the weighting factor was calculated and added to the data file. The weighting factors were adjusted before the data analysis in such a way that the results could be represented at national level.

This present study used children aged 16 to 23 months for analysis. The total of 1709 children were analysed in this study. The full immunisation has been defined as those who completed one dose of BCG, three doses of Polio, three doses of DPT and one dose of Measles. These dependent variables were tested against independent variables which are further subdivided into enabling, predisposing and external environmental factors as classified by Putri Herliana and Abdel Douiri in an article published at BMJ Open.<sup>10</sup>

## RESULTS

Table 1 shows that among the fully immunised children, over a half of the fully immunised

**Table 1.** Distribution of respondents by external environmental factors for full immunisation (n=1709)

Characteristics	Number	Percent (%)
<b>Ecological zone</b>		
Mountain	110	6.5
Hill	699	40.9
Terai	899	52.6
<b>Place of residence</b>		
Urban	928	54.4
Rural	781	45.6
<b>Types of fuel used</b>		
Clean	404	25.5
Polluting	1178	74.5
<b>Toilet facility</b>		
Yes	1268	80.3
No	311	19.7
<b>Province</b>		
Province 1	290	17.0
Province 2	392	23.0
Province 3	263	15.4
Province 4	168	9.8
Province 5	335	19.6
Province 6	114	6.7
Province 7	146	8.5

children were living in the Terai i.e. 899 (52.6%) and in the urban area i.e. 928 (54.3%). A quarter (25.5%) of them were using clean fuel i.e. LPG gas, electricity and solar power. The polluting fuels were considered those who used diesel, petrol, timber, firewood. About 1268 (80.3%) used the modern toilet facility. At the province level, province two had the maximum i.e. 392 (23%) of fully immunised children and province six had least i.e. 114 (6.7%).

The predisposing characteristics have been further sub-classified into the demographic structure, social structure and health beliefs. Table 2 shows information about the socio-demographic characteristics of fully immunised children. Male 915 (53.5%), a child born as first-order 1471 (86.1%) and mothers who gave their first birth at age < 20 years 1067 (62.4%) reported complete immunisation status. The results also indicated

**Table 2:** Distribution of respondents by socio-demographic characteristics (n=1709)

Characteristics	Number	Percent (%)
<b>Gender</b>		
Male	915	53.5
Female	798	46.5
<b>Birth Order</b>		
1 to 3 children	1471	86.1
4 to 6 children	210	12.3
More than 7 children	28	1.6
<b>Age of Mother</b>		
< 20 Years	1067	62.4
> 20years	642	37.6

higher trends of giving birth at the age below 20 in Nepal.

Table 3 shows the distribution of fully immunised children by social structure. Educated mothers were 1208 (70.7%), whereas educated fathers were 1492 (87.9%). A total of 1672 (97.8%) fathers had some profession and 1020 (59.7%) mothers did not.

Table 4 shows information about health belief factors. About 1380 (80.8%) mothers reported they did not use the internet at all and 1137 (66.6%) reported that they didn't have a radio at the household. Among the total, about 783 (45.8%) reported they do not listen to the radio at all and there were 1616 (94.6%) mothers who did not smoke anything.

Wealth index, ANC (Antenatal Care), PNC (Postnatal Care) history and distance to the health facility were further analysed as enabling resources (Table 5). About 963 (56.4%) were from the middle class and rich category. Similarly, about 1140 (73.5%) of mothers reported 4 and 4+ ANC visits. About 1050 (64.2%) reported institutional delivery and 1136 (76.1%) were advised for SBA assisted delivery. Those mothers who reported about their baby were small at birth was 289 (16.9%). About 970 (56.8%) considered distance to the health facility was a big problem and 1683 (98.5%) reported to have ever breastfed to their children. It

**Table 3.** Distribution of respondents by social structure (n = 1709)

Characteristics	Number	Percent (%)
<b>Mother education</b>		
Uneducated	501	39.3
Educated	1208	70.7
<b>Father education</b>		
Uneducated	207	12.1
Educated	1492	87.9
<b>Working status of the mother</b>		
Working	1020	59.7
Not working	688	40.3
<b>Working status of the father</b>		
Working	1672	97.8
Not working	30	2.2

is clear from the table that almost all the children were breastfed at some point of time in their life. Also, those stunted children 327 (38.8%) and wasted children 84 (10.4%) were also fully immunised. Postnatal checkup was received by 482 (86.8%) mothers and with fully immunised children.

## DISCUSSION

In this study, full immunisation is considered as the state of immunisation of the children aged 16 to 23 months who received at least five basic doses of vaccine. The same definition has been adopted in this study as of DHS report for complete immunisation.<sup>9</sup> In the present study, half of the fully immunised children are living in the Terai region, followed by the hilly region and mountain region. Nepal has urban-rural disparities on immunisation coverage. Since the Terai areas of Nepal consists of maximum population density,<sup>11</sup> the maximum number of immunised children are in the same region. An Indian study shows the role of social determinants such as economic status, geographical distribution, educational status, maternal literacy and per capita income of a household. Higher inequalities (97%) in full immunisation coverage at national level were due to these characteristics.<sup>12</sup> In a similar context, a review study urges the use of information from a national-level study on policy formulation.<sup>13</sup> There might be limited evidence of

**Table 4.** Distribution of respondents by health belief factors (n = 1709)

Characteristics	Number	Percent (%)
<b>Frequency of using internet</b>		
Not at all	1380	80.8
Less than once a week	36	2.1
At least once a week	102	5.9
Almost every day	191	11.2
<b>Radio at Household</b>		
No	1137	66.6
Yes	442	25.9
Not a dejure resident	129	7.5
<b>Frequency of listening radio</b>		
Not at all	783	45.8
Less than once a week	502	29.4
At least once a week	423	24.8
<b>Smoking habits of mothers</b>		
No	92	5.4
Yes	1616	94.6

the use of published evidence in policy levels in the developing world.

Access to an improved lavatory may have enough influence to a healthy life. In this study, access to the toilet has been also compared among those with complete immunisation. Geographical as well as provincial disparities were also observed in immunisation. Though there have been various advocacies on gender equalities, the gender difference in complete immunisation is observed in this study. A study from Sub-Saharan Africa shows that there is a sex difference in immunisation service uptake. It also includes the mother's socio-demographic characteristics such as birth order, maternal age, marital status, etc as factors for immunisation.<sup>14</sup>

Mothers who gave birth to only up to three children are more likely to have completely vaccinated their children than others. In this study, seven mothers among ten were educated. Besides, the working status of the father and mother also influenced immunisation. A Nigerian study shows that immunisation coverage depends on child order, delivery place, number of children and retention of immunisation cards. In addition to this, 22.1 percent children aged 0 to 59 month were fully

**Table 5.** Distribution of respondents by enabling resources for full immunisation (n=1709)

Characteristics	Number	Percent (%)
<b>Wealth category</b>		
Poor	746	43.6
Middle and Rich	963	56.4
<b>ANC Checkup Status</b>		
Less than 4 or No visit	411	26.5
4 and more visit	1140	73.5
<b>PNC checkup within 72 hours status</b>		
No	994	64.1
Yes	556	35.9
<b>Delivery place</b>		
Home delivery	586	35.8
Institutional delivery	1050	64.2
<b>Advised SBA</b>		
No	357	23.9
Yes	1136	76.1
<b>Perception regarding small size at birth</b>		
No	1417	83.1
Yes	289	16.9
<b>Distance to health facility</b>		
Big problem	970	56.8
Not a big problem	738	43.2
<b>Ever breastfeeding status</b>		
No	26	1.5
Yes	1683	98.5
<b>Stunting status</b>		
No	515	61.2
Yes	327	38.8
<b>Service provider for PNC check-up</b>		
Skilled health workers	482	86.8
Semi-skilled health workers	67	12.1
TBA and others	6	1.1
<b>Wasting status</b>		
No	757	90.0
Yes	84	10.0

immunised and 29 percent never received any vaccination.<sup>15</sup> Another study from Kenya also showed the role of household wealth quintile, parents' education, SBA assistance during delivery, birth order, place of residence, provinces and father occupation in immunisation completeness. The study further went for multivariate analysis and computed concentration index (C). The overall C for measles immunisation was 0.08 and mostly explained through parental education (28%), birth order (33%) and wealth (60%). The rural residence reduced this inequality.<sup>16</sup> In this study, middle and rich families had 56.4% complete immunisation whereas those born as first to the third child were 86.1%. Bharati et al. (2013) showed the role of mother's education, wealth index as influencing factors for immunisation, nutrition and morbidity of infants.<sup>17</sup>

A study raised the importance of reviewing the immunisation program from equity perspectives and stated that supplementary immunisation activities (SIA) as the better measure to ensure better vaccination coverage.<sup>18</sup> However, in this study, we could not analyse the role of SIA for vaccination coverage. Similarly, another Nepalese study showed that improved immunisation coverage in Nepal is due to the improved equity gap.<sup>7</sup> On the other hand, an Indian study showed that male-female proportions of health service utilisation are significantly different. The study showed that the immunisation scores for the girls were lower than boys.<sup>19</sup> In this study, we have observed little difference in it. Furthermore, another multi-country study emphasised monitoring economic-related inequalities in immunisation coverage to reveal where a gap exists and it further states about the importance of reaching disadvantaged populations.<sup>20</sup> Despite closing the inequality gap, consideration should be given using a thorough multilevel approach that focuses on both supply and demand-side barriers to deliver vaccination for hard to reach areas and population.<sup>21</sup> Additionally, a study from Nepal stated the need to strengthen its antenatal care services, education level of mothers and girls to improve immunisation.<sup>22</sup> In the present study, we also found that those mothers with 4+ ANC (73.5 %) visit had completely immunised their children.



Media exposure can be influencing factors for immunisation. In this study, two-third of mothers reported they have a radio at the household and more than forty-five percent reported they did not listen to a radio. A study from Swaziland also concluded about the strong role of media which influences the use of maternal health care services and childhood immunisation. The study further recognised the role of the age of mothers, women with high parities and their economic condition. The study showed that mothers aged 20-24 years are forty percent more likely to have immunised their children.<sup>23</sup> Since we are only relying on descriptive statistics we are unable to comment about the role of maternal age on immunisation service utilisation however our study shows the mother less than aged 20 years have more fully immunised children. This might be due to factors such as early childbearing and delivery trend among Nepalese women. In our study among completely immunised children, 71% were the children of educated mothers whereas the father's percentage was 87.3. In both of studies, the father had higher education level.

The enabling resources such as wealth index, ANC history, PNC history, distance to the health facility, etc. have been considered as enabling resources. Three-fourths of children whose mother went for four and more ANC visits were fully immunised. In the same context, the PNC checkup of the mother within 72 hours is supported by the national protocol. The increasing trend of institutional delivery was reported by different demographic health surveys.<sup>9,24</sup> The mothers who delivered at a health facility were more likely to have their child fully immunised. More than three fourth of the mothers of the children who were advised SBA have their child fully immunised. Research undertaken in Nigeria recommended increasing the SBA assisted delivery including women empowerment, girl's education, sexual and reproductive health education, accessible and improved health care services. Additionally, it was found in a Nigerian study, there was an increasing trend of SBA assisted delivery from 32.4% to 38.5% from 1990 to 2013.<sup>25</sup> Still in Nepal, 76% of women who received assistance from SBA all the required doses of the antigen of their children.

Rossi (2015) also claimed that vaccination coverage is increased by improving access to antenatal care and education status of parents. The study concluded that mothers with secondary and higher-level education were more likely to be immunised (70.3%).<sup>26</sup> In our study, we found a similar status that children of educated parents were more completely immunised.

Distance to a health facility is reported as a problem in this study. A study from Kenya shows that increasing access to health facilities can increase access to essential vaccination.<sup>27</sup> Fernandez and Awofeso have also emphasised on the closing gap between urban-rural gaps in Indonesia to improve vaccination status.<sup>28</sup> However, in our study, we have only 43.2% of mothers who reported that they do not feel reaching health facilities is a problem. Similarly, the present study does not talk about immunisation clinic distance, therefore despite the long distance to health facilities, the distance to the immunisation clinics might have been short.

The present study showed more similarities with Nigerian study where a child, parental and socioeconomic barriers are mainly responsible for immunisation coverage.<sup>15</sup> In our study, despite socio-economic barriers, people have been fully immunising their children. Higher maternal antenatal services and utilisation are positively associated with immunisation service coverage in Ethiopia.<sup>29</sup> Another multi-country study considered maternal and paternal education as one of the screening variables to identify children who are likely to miss vaccination.<sup>30</sup> These strategies can be milestones in achieving complete immunisation. All these studies have emphasised the role of socio-economic determinants on immunisation services however limited study talks about the cost of immunisation. In Nepal, eleven types of antigens are provided free of cost by the government of Nepal.<sup>4</sup> The cost factors, less distance to immunisation clinics can be other contributors even with a low socio-economic status in the Nepalese context.

The present study is limited as being only to secondary data collected from the DHS Program in 2015. Therefore, we are unable to comment on the

current status of fully immunised children. Similarly, we are unable to comment about the enumerator's ability to trace immunisation specific information, data quality, and procedure of information collection.

## CONCLUSIONS

Significant difference based on external environment, enabling factors and predisposing factors for full immunisation status was observed. The use of maternal health services at ANC and

postnatal period can influence the uptake of children immunisation services. Therefore, specific interventions based on these factors are recommended. The present study only deals with secondary data of 2016, therefore studies based on primary data for immunisation is also recommended.

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