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Impact of Use of Health Care on Under-5 Child Mortality among States and Regions: Analysis of the 2015-16 Myanmar Demographic and Health Survey

Nyaung Tai
Su Hlaing Tin Htut
Thiri Swe

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Impact of Use of Health Care on Under-5 Child Mortality among States and Regions

Analysis of the 2015-16 Myanmar Demographic and Health Survey

Nyaung Tai¹
Su Hlaing Tin Htut¹
Thiri Swe¹

June 2019

¹ Central Statistical Organization

Corresponding author: Nyaung Tai, Central Statistical Organization, Ministry of Planning and Finance, Office 32, Nay Pyi Taw, Myanmar; phone: +95 9450984662; fax: +95 67 406257; email: nyaungtai@gmail.com



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ABSTRACT

This paper examines the impact of the health care services on under-5 mortality in Myanmar's States and Regions. Reducing under-5 child mortality is the first target under Sustainable Development Goal 3. According to world health statistics, Myanmar is a low-income country in Southeastern Asia with high maternal deaths. In 2015, Myanmar had an under-5 mortality rate that was higher than the regional average. This research investigated the impact of health care services on under-5 mortality among Myanmar's States and Regions by examining relevant socioeconomic and demographic factors from the first Myanmar Demographic and Health Survey (2015-16). It is possible that all factors examined in this study could affect the relationship between use of health care and under-5 mortality. All variables were included in the multivariate analysis, although only some variables had a statistically significant association with the outcome variable. The risk of child mortality was significantly higher for children of higher birth order (4-5: OR: 1.85; 95% CI: 1.01-3.38; $p=0.048$; 6 or more: OR: 2.11; 95% CI: 1.04-4.28; $p=0.039$). Children who received health services had a reduced risk of childhood death (OR: 0.06; 95% CI: 0.01-0.29; $p=0.000$) compared with children who did not. The risk of child mortality was significantly reduced for children whose mothers accessed antenatal care at a government hospital, private hospital, or mobile clinic (OR: 0.39; 95% CI: 1.06 -5.15; $p=0.000$). The study results highlight the determinants of under-5 child mortality among Myanmar's States and Regions.

KEY WORDS: Under-5 mortality; health care delivery; socioeconomic and demographic factors; Myanmar

ACRONYMS AND ABBREVIATIONS

3MDG	Three Millennium Development Goal Fund
ANC	antenatal care
CRVS	civil registration and vital statistics
CSO	Central Statistical Organization
DHS	Demographic and Health Survey
GHO	Global Health Observatory
MDG	Millennium Development Goal
MDHS	Myanmar Demographic and Health Survey
MOHS	Ministry of Health and Sports
PNC	postnatal care
SDG	Sustainable Development Goal
USAID	United States Agency for International Development

1 INTRODUCTION

Under-5 child mortality is one of the vital impact indicators of a country's development. According to global indicators, 15,000 under-5 children die every day. This is equivalent to almost 5.6 million child deaths a year. Global Health Observatory (GHO) 2016 data show that the under-5 mortality rate was 73.1 deaths per 1,000 live births in low-income countries (World Health Organization 2016). High rates of maternal and child mortality in developing countries are key health policy issues to be solved (Pettersson-Lidbom 2014).

In Myanmar, under-5 mortality was 50 deaths per 1,000 live births in the 2015-16 Myanmar Demographic and Health Survey (MDHS) (MOHS and ICF 2017). Seventy percent of the population lives in rural areas in Myanmar. Addai (2000) found that low use of maternal and child health services accounted for high maternal and child mortality rates in rural Ghana. The public health care system has focused on providing high-quality health care in areas of greatest need (Fiva, Haegeland, Ronning, and Syse 2014). The public health care system must ensure that all residents have access to quality health services. Improving child health and reducing under-5 deaths requires provision and use of adequate health services and sufficiently skilled health workers.

1.1 Background

The importance of vital statistics to the study of child mortality is critical. In Myanmar, the Civil Registration and Vital Statistics (CRVS) system includes birth and death events. However, the registration of deaths is quite low, especially in rural areas. An efficient CRVS system is crucial in the evaluation of health initiatives that focus on reducing child and maternal mortality. In Myanmar, the improvement of the CRVS system is a priority concern that is important for tracking progress toward the Sustainable Development Goals (SDGs). Without complete vital statistics, nationally representative household surveys such as the MDHS have become critical sources of public health data.

In 2000, Cullis, Jones, and Propper found that knowledge of health supports the use of health care. Every country provides public health programs and health facilities that can ensure public health. In Myanmar, the Ministry of Health and Sports (MOHS) has been supporting health workers in health care delivery at government hospitals. The health care program targets poor households and provides a full-price subsidy for medical expenses at public health facilities for all members of a household (Johar 2009). Cheng (2014) demonstrated the extent of this subsidization of health care on the public sector health expenditures of government hospitals.

Inadequate health services have a negative effect on maternal and child health in developing countries (Agunwa et al. 2017). In Myanmar, mothers and children constitute 60% of the total population (United Nations Office of the High Commissioner of Human Rights 2013). The government has identified maternal and child health services as a priority area in Myanmar's national health plan. As a member state of the United Nations, Myanmar is working diligently to reduce maternal and child mortality and morbidity by supporting mother and child health services in both urban and rural settings. During birth registration campaigns in 2014 and 2015, more than 300,000 under-5 children were registered and given birth certificates in Chin, Mon, Magway, Kayin, Kayah, and Ayeyarwady. According to the 2015-16 MDHS,

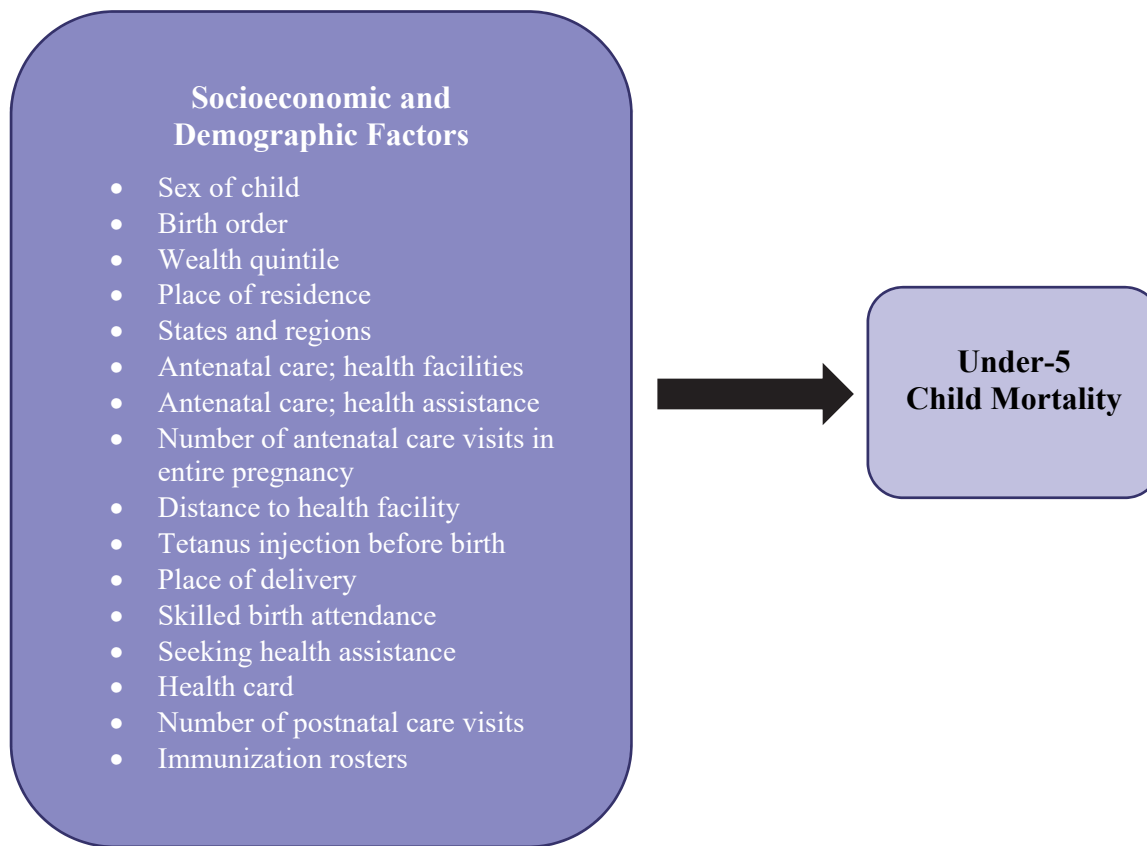
Chin State has the highest under-5 mortality with 104 deaths per 1,000 live births, while Mon State has the lowest with 44 deaths per 1,000 live births (MOHS and ICF 2017).

Essential to maternal and child health services is a thorough understanding of the factors that determine use of such services. Given the regional disparity in under-5 mortality and the inadequate civil registration system, this study used the MDHS data to examine the relationship between child mortality and use of child health services in Myanmar. This report describes the use of health care services such as antenatal care (ANC) from a skilled provider, protection against neonatal tetanus, delivery with a skilled birth attendant, and postnatal care (PNC) across Myanmar's States and Regions.

1.2 Conceptual Framework

The under-5 mortality rate is the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching age 5 if subject to current age-specific mortality rates defined by the Millennium Development Goals (MDGs) (United Nations Statistics Division 2019). This study investigates the factors associated with under-5 child mortality such as sex of child, birth order, wealth quintile, place of residence, states and regions, distance to a health facility, health care provider, location of ANC, frequency of ANC visits, number of tetanus injections before birth, place of delivery, skilled birth attendance, treatment seeking for child illness, possession of a health card, number of PNC visits, and child immunizations.

Figure 1 Conceptual framework



1.3 Research Questions

This study investigates the association of child mortality with the use of health care delivery services such as ANC at facilities from a skilled provider, protection against neonatal tetanus, place of delivery, and PNC within the states and regions of Myanmar. The study seeks to answer the question of whether use of health care services has an impact on under-5 mortality.

2 DATA AND METHODS

2.1 Data

This study used data from the 2015-16 MDHS, a nationally representative population-based survey implemented by the Ministry of Health and Sports, the U.S. Agency for International Development (USAID), the Three Millennium Development Goal Fund (3MDG), and the DHS Program. ICF provided technical assistance through The DHS Program, which assists countries in the collection of data to monitor and evaluate population, health, and nutrition programs.

The MDHS includes four types of questionnaires: Household Questionnaire, Woman's Questionnaire, Man's Questionnaire, and Biomarker Questionnaire. The MDHS provides estimates at the national and regional levels, for urban and rural areas, and for each of Myanmar's 15 states and regions on fertility levels, marriage, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutrition, childhood and maternal mortality, maternal and child health, awareness and behavior related to HIV/AIDS and other sexually transmitted infections, and other health-related issues such as smoking and knowledge of tuberculosis. A total of 12,885 women were interviewed with the Woman's Questionnaire.

This study used the children's data file, which included individual data on a total of 4,815 children age 0-59 months.

2.2 Key Variables and Measurements

2.2.1 Dependent variable

The dependent variable is under-5 mortality measured by whether a child age 0-59 months is either dead (1) or alive (0).

2.2.2 Independent variables

In this study, the independent variables are sex of child, number of ANC visits, distance to health facilities, ANC at facilities, tetanus injection before birth, number of PNC visits, treatment seeking for child illness, and other factors such as birth order, wealth index, place of residence, states and regions, and other variables in the conceptual framework (Figure 1).

- Sex of child is either female or male. Sreeramareddy, Sathyanarayana, and Kumar (2012) found that sex can affect utilization of health services and under-5 child mortality.
- Number of ANC visits is measured by the number of visits, which Kuhnt and Vollmer (2017) found can affect the health of children.
- Birth order is a categorical variable with a child's position in birth order.
- Wealth group (poor, middle, and rich) is an index of socioeconomic status. In this study, the five quintiles in the MDHS were regrouped into three categories of poor, middle, and rich. Filc, Davidovitch, Novack, and Balicer (2014) found that the socioeconomic status of a household could affect the use of health care services.

- Place of residence represents the household's location in an urban or rural area. Ezech et al. (2014) found that under-5 mortality is more common in rural areas.

2.3 Statistical Analysis

This research estimated the overall impact of use of health care services on under-5 child mortality. Since the dependent variable is binary, logistic regression was used to estimate the likelihood of under-5 mortality. The logistic regression model allows for the prediction of outcomes from a set of variables that may be continuous, discrete, dichotomous, or a mix. With logistic regression models, the odds of success are represented by the ratio of the probability of a success to the probability of a failure (Hosmer, Lemeshow, and Sturdivant 2013). Hence, if p is the true success probability, the odds of a success are $p/(1-p)$.

The adapted logistic regression model can be expressed as follows:

$$U5_child\ mortality_{it} = \beta_0 + \beta_1 Sex_{it} + \beta_2 Residence_{it} + \beta_3 Birth_order_r_{it} + \beta_4 Distance_H_fac_{it} + \beta_5 Wealh_qui_{it} + \beta_6 Seeking_H_{it} + \beta_7 ANC_fac_{it} + \beta_8 TT_injection_{it} + \beta_9 POC_Visit_{it} + \beta_{10} Regions_{it} + e_{it}$$

where:

$U5_child\ mortality_{it}$ is a dependent variable that represents under-5 child deaths in the i^{th} child living in year t .

Sex_{it} is a variable for an individual child (1=female and 2=male).

$Residence_{it}$ is a variable for type of residence of individual child (1= urban and 2= rural).

$Birth\ order_{it}$ is a categorical variable for a child's position in the birth order compared to siblings living in year t (1=<1, 2=2-3, 3=4-5, and 4=6+).

$Distance_H_fac_{it}$ is a variable for distance to health facilities of an individual child, as indicated by maternal report (1= big problem, 2= no big problem).

$Wealh_qui_{it}$ is a categorical variable for household wealth (1= poor, 2= middle, and 3= rich).

$Seeking_H_{it}$, ANC_fac_{it} , and $TT_injection_{it}$ are variables for utilization of health care (1= no and 2= yes).

POC_Visit_{it} is a categorical variable for number of PNC visits for a child living in year t (1=1, 2=2-3, and 3=4-5).

$Regions_{it}$ is a category variable for States and Regions of an individual child.

(1= Kayah State, 2= Kachin State, 3= Kayin State, 4= Chin State, 5= Sagaing Region, 6= Taninthayi Region, 7= Bago Region, 8= Magway Region, 9= Mandalay Region,

10= Mon Region, 11= Rakhine Region, 12= Yangon Region, 13= Shan State,
14= Ayeyarwady Region, and 15= Naypyitaw).

E_{it} represents the error terms.

3 RESULTS

3.1 Descriptive Analysis

In May 2016, the Central Statistical Organization (CSO) of the Ministry of Planning and Finance and the United Nations Development Programme jointly examined the readiness and availability of Myanmar's data to measure the SDG indicators. According to the indicators, the proportion of deliveries with skilled birth attendants is lowest and the under-5 mortality rate is highest in Myanmar compared to the regional average. Table 1 presents the comparison of the proportion of skilled birth attendance and under-5 mortality rate between Myanmar, South-East Asia, and the world.

Table 1 Major Indicators of Sustainable Development Goal 3: 2015

Goal 3	Indicator	Myanmar	South-East Asia	World
3.1.2	Proportion of births attended by skill birth attendants	60.2%	83.7%	75.4%
3.2.1	Under-5 mortality rate (per 1,000 live births)	50	27.2	42.5

Source: 2015-16 Demographic and Health Survey, Vital Registration System, CSO

In 2012, Bhandari showed that under-5 mortality is higher in Asian countries than in other parts of the world. The Ministry of Health and Sports is working to reduce under-5 mortality in the States and Regions of Myanmar. Table 2 shows the under-5 mortality rate by region in Myanmar from several surveys.

Table 2 Under-5 mortality rate by States and Regions

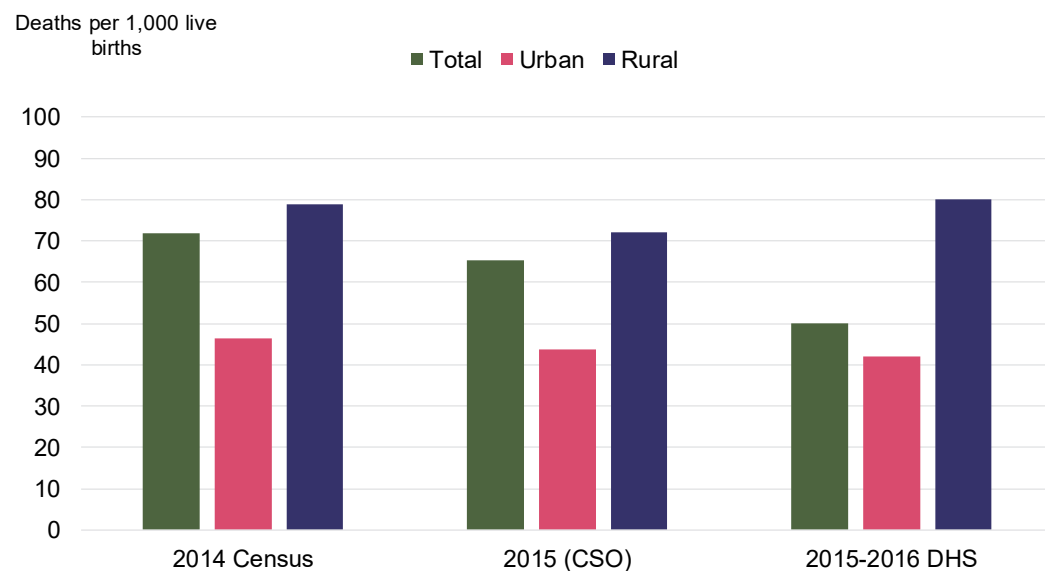
Area	2014 Census	2015 CSO	2015-16 MDHS
Total	71.8	65.3	50
Urban	46.3	43.8	42
Rural	78.8	72.1	80
Kachin	60.6	52.6	61
Kayah	69.7	62.7	50
Kayin	61.6	57.3	84
Chin	89.6	82.1	104
Sagaing	69.6	58.4	68
Tanintharyi	83.4	75.7	83
Bago	72.0	68.4	83
Magway	100.6	94.5	55
Mandalay	58.4	57.0	65
Mon	47.3	42.5	44
Rakhine	71.0	58.1	58
Yangon	51.0	46.5	(46)
Shan	64.0	58.5	99
Ayeyawady	103.6	96.6	82
Nay Pyi Taw	63.8	59.3	79

Note: Figures in parentheses are based on 250-499 unweighted person-years of exposure to the risk of death and should be interpreted with caution.

Source: The 2014 Myanmar Population and Housing Census Report; Vital Statistics Report, Central Statistical Organization (CSO) 2014-15; and Myanmar Demographic and Health Survey (MDHS) 2015-16.

Figure 2 shows the comparison of under-5 mortality rate between urban and rural areas in Myanmar. The rate of under-5 mortality is higher in the rural areas compared with urban.

Figure 2 Comparison of under-5 child mortality rate between urban and rural areas



Source: The 2014 Myanmar Population and Housing Census Report; Vital Statistics Report, Central Statistical Organization (CSO) 2014-15; and Myanmar Demographic and Health Survey (MDHS) 2015-16.

Table 3 presents the outcome variable along with the socioeconomic and demographic factors of respondents. A total of 218 children had died out of 4,815 under-5 children during the 5 years before the survey. Of all children under age 5 in the sample, the sex of child was 47.5% female and 52.5% male. The majority of the study sample (79%) included children of mothers living in rural areas, while only 21% are children of mothers living in the urban areas. With birth order number, 32.2% were the oldest child, 40.5% were second and third, 16.3% were fourth and fifth, and 10% were sixth and above. With distance to health facilities, most parents (67.8%) said that travel to a facility was not a big problem, while 32.2% of parents said travel was a considerable problem. Respondents represented three levels of wealth: poor (53.5%), middle (18.1%), and rich (28.7%). With treatment seeking for child illness, 98.96% of parents were not seeking treatment, while only 1.04% of parents sought treatment. Respondents visited health facilities for ANC. Government hospitals, private hospitals, and mobile clinics were accessible to most (69.47%), while 30.53% did not have access to any health facility. A total of 80.62% of women accessed tetanus injections, while 19.38% did not. With PNC visits, 1 time was 63.01%, 2-3 times 36.55 %, and 4-5 times 0.44 %. Respondents came from 15 States and Regions: Kachin (7.33%), Kayah (7.87%), Kayin (7.29%), Chin (9.95%), Sagaing (7.23%), Taninthayi (6.83%), Bago (5.82%), Magway (5.61%), Mandalay (5.57%), Mon (5.13%), Rakhine (7.41%), Yangon (5.15%), Shan (7.29%), Ayeyarwady (6.52%), and Naypyitaw (5.01%).

Table 3 Outcome variables and factors of respondents

Factors	Respondents (%)	(N=4,815)
Outcome variable		
Under-5 child mortality		
Alive	4,597	(95.47%)
Dead	218	(4.53%)
Independent variable		
Sex of child		
Female	2,528	(47.50%)
Male	2,287	(52.50%)
Place of residence		
Urban	1,012	(21.02%)
Rural	3,803	(78.98%)
Number of birth order		
<1	1,549	(32.17%)
2-3	1,951	(40.52%)
4-5	787	(16.34%)
6+	528	(10.97%)
Distance to health facilities		
Big problem	1,549	(32.17%)
Not a big problem	3,266	(67.83%)
Wealth quintile		
Poor	2,564	(53.25%)
Middle	870	(18.07%)
Rich	1,381	(28.68%)
Treatment seeking		
No	4,765	(98.96%)
Yes	50	(1.04%)
Antenatal care facilities: government hospital, private hospital, and mobile clinic		
No	1,470	(30.53%)
Yes	3,345	(69.47%)
Tetanus injection before birth		
No	933	(19.38%)
Yes	3,882	(80.62%)
Independent variable		
Number of postnatal care visits		
1	3,034	(63.01%)
2-3	1,760	(36.55%)
4-5	21	(0.44%)
States & Regions		
Kachin	353	(7.33%)
Kayah	379	(7.87%)
Kayin	351	(7.29%)
Chin	479	(9.95%)
Sagaing	348	(7.23%)
Taninthayi	329	(6.83%)
Bago	280	(5.82%)
Magway	270	(5.61%)
Mandalay	268	(5.57%)
Mon	247	(5.13%)
Rakhine	357	(7.41%)
Yangon	248	(5.15%)
Shan	351	(7.29%)
Ayeyarwady	314	(6.52%)
Naypyitaw	241	(5.01%)

3.2 Bivariate Analysis and Multivariate Analysis

Table 4 shows the results of the logistic regression by bivariate and multivariate analysis. The findings indicate that there is significant relationship between the use of health care and under-5 child mortality.

Table 4 Bivariate and multivariate analysis of the relationship between use of health care and under-5 child mortality

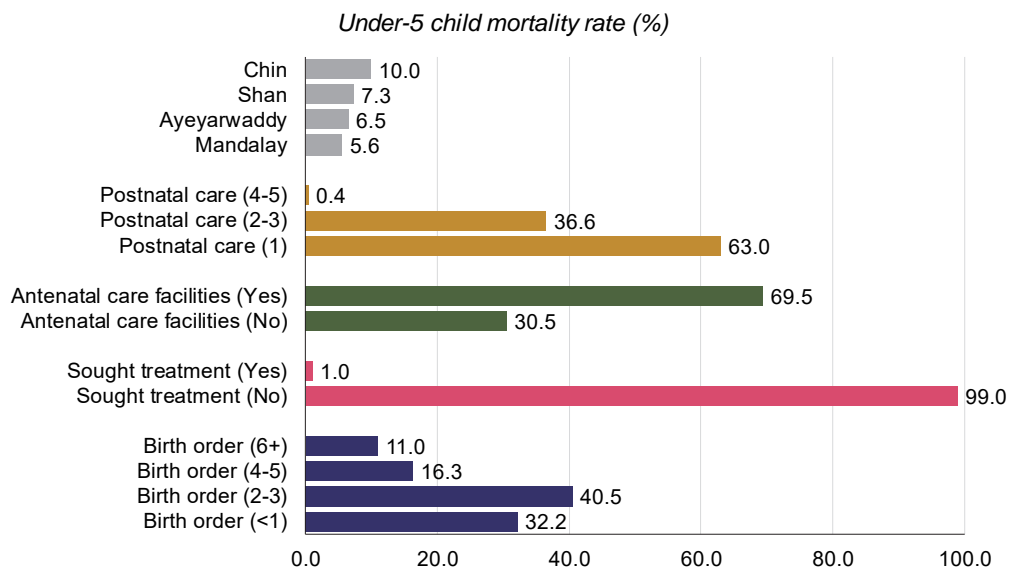
Demographic and socioeconomic characteristics	Bivariate analysis		Multivariate analysis	
	Odds ratio (95% CI)		Odds ratio (95% CI)	
Sex of child				
Female (Reference)	1		1	
Male	1.21	(0.83-1.75)	1.16	(0.79-1.72)
Place of residence				
Rural (Reference)	1		1	
Urban	0.61*	(0.37-0.99)	1.06	(0.55-2.05)
Number of birth order				
<1 (Reference)	1		1	
2-3	1.27	(0.81-1.99)	1.10	(0.67-1.72)
4-5	2.26 ***	(1.21-4.22)	1.85 *	(1.01-3.38)
6+	2.94***	(1.61-5.36)	2.11*	(1.04-4.28)
Distance to health facilities				
Big problem (Reference)	1		1	
Not a big problem	0.61**	(0.39-0.95)	0.99	(0.65-1.49)
Wealth quintile				
Poor (Reference)	1		1	
Middle	0.74	(0.46-1.17)	1.02	(0.61-1.72)
Rich	0.43***	(0.26-0.71)	0.69	(0.39-1.24)
Treatment seeking				
No (Reference)	1		1	
Yes	0.12***	(0.03-0.51)	0.06***	(0.01-0.29)
Tetanus injections before birth				
No (Reference)	1		1	
Yes	0.66*	(0.43-1.03)	1.25	(0.74-2.11)
ANC facilities: government hospital, private hospital, and mobile clinic				
No (Reference)	1		1	
Yes	0.23***	(0.16-0.34)	0.39***	(0.25-0.60)
Number of PNC visits				
1 (Reference)	1		1	
2-3	4.03***	(2.70-6.01)	2.27***	(1.49-3.44)
4-5	10.61***	(2.40-46.83)	5.28**	(1.75-15.92)
Region				
Kayah (Reference)	1		1	
Chin	3.37***	(0.41-7.12)	2.34*	(1.06-5.15)
Kayin	1.72	(0.66-4.41)	1.72	(0.66-4.46)
Kachin	1.30	(0.51-3.29)	1.44	(0.56-3.71)
Sagaing	1.44	(0.63-3.28)	1.91	(0.78-4.64)
Taninthayi	2.30*	(0.83-6.40)	2.05	(0.81-5.19)
Bago	1.36	(0.57-3.22)	2.24	(0.92-5.49)
Magway	1.31	(0.53-3.25)	1.92	(0.75-4.93)
Mandalay	1.88	(0.70-5.05)	3.25*	(1.18-8.97)
Mon	1.23	(0.43-3.53)	1.75	(0.61-4.95)
Rakhine	1.17	(0.48-2.83)	1.00	(0.37-2.71)
Yangon	1.07	(0.33-3.44)	2.22	(0.63-7.85)
Shan	2.87***	(1.26-6.53)	3.24**	(1.47-7.14)
Ayeyarwady	1.74	(0.76-4.01)	2.62*	(1.09-6.28)
Naypyitaw	1.50	(0.57-3.99)	2.08	(0.75-5.77)

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The bivariate analysis showed a statistically significant association between child mortality and variables such as place of residence, birth order, distance to health facilities, wealth quintile, seeking health care, tetanus injections before birth, ANC facilities such as government hospitals, private hospitals, and mobile

clinics, number of PNC visits, and region. However, sex of the child was not significantly associated with child mortality. We included all covariates in the multivariate analysis. The risk of child mortality was significantly higher for children with the fourth and fifth birth order (OR: 1.85; 95% CI: 1.01-3.38; p=0.048) and six or more birth order (OR: 2.11; 95% CI: 1.04-4.28; p=0.039), respectively. Children whose caregivers sought treatment had a reduced risk (OR: 0.06; 95% CI: 0.01-0.29; p=0.000) of childhood death compared with children whose caregivers did not seek treatment. The risk of child mortality was significantly reduced for children whose mothers accessed ANC facilities such as government hospitals, private hospitals, and mobile clinics (OR: 0.39; 95% CI: 1.06-5.15; p=0.000). The risk of child mortality was also significantly increased for children whose mothers had PNC 2-3 times (OR: 2.27; 95% CI: 1.49-3.44; p=0.000) and 4-5 times (OR: 3.25; 95% CI: 1.18-8.97; p=0.003). The study found a positive relationship between PNC visits and under-5 mortality. Being born in the Chin Region (OR: 2.34; 95% CI: 1.06-5.15; p=0.035), Mandalay Region (OR: 2.34; 95% CI: 1.06-5.15; p=0.035), Shan Region (OR: 3.24; 95% CI: 1.47-7.14; p=0.004), and the Ayeyarwady Region (OR: 2.62; 95% CI: 1.09-6.28; p=0.032) was significantly associated with an increased risk of childhood death compared with children born in the Kayah Region.

Figure 3 Significant associations with under-5 child mortality in States and Regions



This study evaluated the association between use of health care services and under-5 child mortality among the states and regions of Myanmar. The results of the logistic regression show a significant association between use of health care services and under-5 child mortality. However, there are no significant associations among the other factors such as sex of the child, place of residence, distance to health facilities, wealth quartiles, tetanus injections before birth, and some States and Regions (Kachin, Kayah, Sagaing, Taninthayi, Bago, Magway, Mon, Rakhine, Yangon, and Naypyitaw) and under-5 child mortality.

4 DISCUSSION AND CONCLUSION

This study found a significant association between use of health care services and under-5 mortality in some States and Regions of Myanmar. The sex of child was not statistically significant for the prediction of child mortality. Choe, Hongsheng, and Feng (1995) had found that, among first-born children, sex was not a statistically significant predictor of childhood mortality. This study also found that living in rural areas did not have a statistically significant association with child mortality, when adjusted for problems accessing health facilities. This could be due to poor availability of well-equipped health facilities in rural areas. Rutherford, Mulholland, and Hill (2010) found that traditional health care facilities were more likely to be associated with under-5 child death in rural areas. This study provides clear evidence of the impact of birth order on under-5 child mortality. According to the multivariate proportional hazards regression model, a child with a birth order of 6 or higher with a short preceding birth interval had the highest risk of infant mortality in Zimbabwe (Kembo and Van Ginneken 2009).

In this study, the distance from home to health facilities did not have a statistically significant association with under-5 child death. Hossain (2010) showed that utilization of health services may have associations with factors such as distance from health facilities, presence of health care services in the community, and distance from the nearest skilled attendant. Do (2009) found that the number of births was positively associated with skilled birth attendance in the private sector. This study found no association between wealth status and child mortality, after controlling for other factors, although Mohammad and Tabassum (2016) found an association between the poorest wealth quintile and under-5 mortality.

Dusabe (2016) found a significant association between treatment-seeking behavior and childhood mortality. In 2017, Chadoka-Mutanda and Odimegwu also found that maternal health-seeking behavior was associated with a reduction in under-5 child mortality. Our results confirm the positive effect of seeking treatment on under-5 child mortality. We also found that tetanus injections before birth did not have a statistically significant association with child mortality. However, Singh, Pallikadavath, Ram, and Alagarajan (2013) found a significant relationship between tetanus injection before birth and neonatal mortality in under-5 mortality. This finding provides evidence of the impact of ANC facilities (such as government hospitals, private hospitals, and mobile clinics) on under-5 child mortality. Rutherford, Mulholland, and Hill (2010) found a significant positive association between improving adequate access to health care and reduction of child death in developing countries.

Research has found a significant negative association between ANC visits of four or more and the reduction of neonatal mortality risk (Singh, Kumar, and Kumar 2013; Singh, Pallikadavath, Ram, and Alagarajan 2013). This study found that the risk of child mortality was significantly higher with an increasing number of PNC visits. This could be due to greater access to maternal and child health services or to infants who were gravely ill and at greater risk of death having a greater number of PNC visits. Grepin and Savedoff (2009) showed that skilled delivery of maternal health services ensured effective treatment that reduced maternal and child mortality. Kumar et al. (2014) found an association of infant, neonatal, and under-5 child mortality with sociodemographic and maternal care variables such as four or more ANC visits, health facility delivery, and PNC.

Hilly regions such as Chin State and Shan State are more likely to have relatively higher under-5 child mortality than other states because of poor income, poor roads, lack of health care services, lack of health awareness, and a greater number of births to women. This study found that the Mandalay Region, the third capital city and a large urban area, is more likely to have relatively higher under-5 child mortality than some other regions. The maternal mortality rate is also higher in Mandalay Region (Kumar et al. 2014). This finding suggests that maternal mortality is associated with the risk of child mortality in some areas. The logistic regression also showed significantly higher odds of under-5 child mortality in the Ayeyarwady Region. This region has faced many natural disasters that affect socioeconomic factors. Residents who live in the Ayeyarwady Region have fewer resources and a limited ability to access the few existing local health facilities. According to the under-5 child mortality rankings, Chin State and Shan State are in the highest range (86-104), Ayeyarwady Region the second highest range (81-85), and Mandalay Region the second lowest range (51-65) (MOHS and ICF 2017).

4.1 Implications

The odds of under-5 child mortality are higher among those who did not access health care and those with increasing birth order. Myanmar residents who live in rural areas lack awareness of health-seeking behavior and access to formal health services, and may use traditional providers and cultural practices instead of formal health care. Umeh and Feeley (2017) determined that wealth had no effect on access to health care services, which we also found after controlling for other factors. Failure to use ANC facilities, skilled birth assistance, ANC and PNC, and tetanus injection is associated with a greater risk of under-5 child mortality. Improving maternal health is an important priority for reducing child mortality.

Kaibung'a, Mavole, and Okuku (2017) found that poor utilization of health care is related to an inadequate number of hospitals, lack of communications, and poor road networks in the rural areas. Improving access to health care delivery in pregnancy, providing skilled care during childbirth, and offering injections are difficult in Myanmar's hilly regions and those areas that have faced many natural disasters. Poverty, the long distance from health facilities, an inadequate number of hospitals and skilled providers, lack of communications, and the poor road network of the rural community make it difficult to access health facilities in Myanmar.

4.2 Conclusion

This study evaluated the impact of the use of health care services on under-5 child mortality among the states and regions in Myanmar. The logistic regression results show that the odds of under-5 mortality increase with an increasing number of children, although most parents are less interested in using health care services as they have more children. This suggests that merely encouraging parents to seek health care for their children is insufficient. Being a child with a birth order of 4-5 or 6 or more, being a child of a woman who utilized PNC, and being a child of a woman living in Chin and Shan States and the Ayeyarwady and Mandalay Regions was significantly associated with greater child mortality.

This study suggests that utilization of health care services such as delivery in health facilities is a complex issue. This requires further research with qualitative approaches that can increase our understanding of the effect of using health care services on child mortality among the States and Regions in Myanmar, and can explore the barriers to health care delivery for women.

4.3 Policy Recommendations

This analysis yielded some robust results that can help policy makers target the factors that reduce child mortality. The government can strengthen social sectors and can provide good health care through the availability of health personnel, facilities, services, and policies. The empirical evidence provided by this study contributes to the literature that supports the relationship between the use of health care services and the reduction of under-5 mortality in Myanmar. The study results also provide information for Myanmar's policy makers who are expected to increase the country's focus on facilitating access to maternal and child health services for under-5 children and reducing child mortality in the rural areas. In addition, policy makers could also pay greater attention to the factors associated with child mortality, such as higher birth order, by engaging in a public health educational campaign targeted at the low-income households in Myanmar's rural and urban areas.

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