

Effect of Parental Characteristics on Child Mortality in Myanmar

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Abstract

This paper investigates that effect of parental characteristics on child mortality such as infant mortality, neonatal mortality, and under-5 mortalities in Myanmar. This research paper examines the health conditions of the 2015-2016 Myanmar Demographic and Health Survey (MDHS) that is the first DHS conducted in Myanmar, which is a nationally representative population-based survey with large sample sizes. According to the logistics regression estimation, parental characteristics such as wealth quintile, rich was less likely to compare with the poor for under-5 mortality and infant mortality that were statistically significant by (OR: 0.49; 95% CI: 0.26-0.94; $p=0.033$ and OR: 0.46; 95% CI: 0.24-0.92; $p=0.060$); the risk of under-5 child mortality, infant mortality, and neonatal mortality were strongly significant smaller for size of child (OR: 2.22; 99% CI: 1.24-3.95; $p=0.007$), (OR: 2.26; 99% CI: 1.25-4.06; $p=0.007$), and (OR: 3.76; 99% CI: 1.89-7.50; $p=0.000$) respectively. Utilization of health care services such as tetanus injection before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were strongly significant parental characteristics such as wealth quintile, rich (OR: 1.78; 99% CI: 1.27-2.49; $p=0.000$), (OR: 1.40; 99 % CI: 1.07-1.83; $p=0.013$), and (OR: 0.22; 99 % CI: 0.15-0.33; $p=0.000$) respectively. The parental characteristics as wealth quintile, rich was more likely to compare with the poor for utilization of health care services such as tetanus injection before birth and assistance of the nurse/midwife; wealth quintile, rich was less likely to compare with poor for the assistance of traditional birth attendant. This paper finds suggests a significant and negative relationship between parental characteristics and child mortality; a positive relationship between health care services and parental characteristics.

Keywords: Logistics Regression Method, Child Mortality, Parental Characteristics, Utilization of Health Care Services.

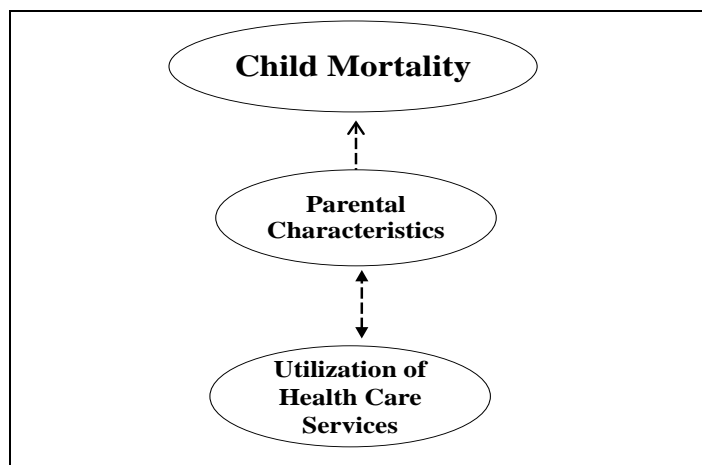
1. Introduction

The public health care system is very important for low-income countries' people who are in need of quality indispensable one-stop service to all citizens. The public health care system has offered equality of receiving high-quality health care in selection criteria for socioeconomic status on the geographic location[1]. On other hands, parental characteristics such as age, education, household wealth, type of places, number of birth order and size of children which are very important to utilize health care service. According to World Health Statistics, Myanmar is a low-income country in Southeast Asia with high child deaths [2]. The characteristic of very high child mortality is reflected in very low life expectancy for health conditions [3]. According to the UN child mortality estimation, 5.5 million children under-5 old died 15,000 every day in 2017 [4]. Globally, the under-5 mortality rate was 39 deaths per 1,000 live births and neonatal mortality rate was 18 deaths per 1,000 live births in 2017 [4]. The leading causes of under-5 child mortalities were complications during birth, pneumonia, diarrhoea, neonatal sepsis and malaria. The research found that high maternal and child mortality in developing countries is one of the important key health policy issues to be

solved [5]. In Myanmar, the government has undertaken “people-centred development” policy for the nation, which is implementing “Let’s invest in the development of community-centred health” for nation’s slogan. Healthy life is very important role for everyone which can play the development of national human resources for every sector. Reducing under-5 child death is the target 3.2 under Sustainable Development Goal (SDG) Goal 3 [6].

1.1 Conceptual Framework

The research paper findings suggest a significantly negative relationship between parental characteristics and child mortality and a positive relationship between parental characteristics and utilization of health care services. According to the logistics regression estimation and hypothesis of results, these results will be expected statically significant. The potential sources of endogeneity are parent’s ability, family income, lack health knowledge, and causes of child death in the logistics regression.



1.2 Research Questions

This paper provides evidence for the link between parental status and child mortality; utilization of health care services. By investigating these research issues, this paper attempts to answer these important questions. Does parental characteristics effect on child mortality? How does utilization of health care delivery affect parent’s characteristics?

2. Model and Analysis

2.1 Data source

The research methodology uses in this study is descriptive method and empirical analysis from the secondary sources of information. This research paper examines the health conditions of the 2015-2016 Myanmar Demographic and Health Survey (MDHS) that is the first DHS conducted in Myanmar, which is a nationally representative population-based survey with large sample sizes. MDHS survey includes four types of questionnaires such as household questionnaire, woman’s questionnaire, man’s questionnaire, and biomarker questionnaire. It provides estimates at the national and regional levels, for urban and rural areas, and for each of Myanmar’s 15 states and regions. Survey data obtained an emphasis on the importance of improved data quality of estimating child mortality. The study is restricted to examine utilization of child health care that offer parental characteristics and health care services such as maternal age, education, wealth index, number of birth order, size of children, type of residence, region, tetanus injections before birth,

assistance of nurse/ midwife, and assistance of traditional birth attendant, and to analyse child mortality. This research paper will estimate the overall effect of parental characteristics on child mortality.

2.2 Model

This study will use a logistic regression model to analyse the relationship between parental characteristics and child mortality, the association with parental characteristics and utilization of health care services.

Key Variables and Measurements

Dependent variables

The dependent variables are *child mortality and utilization of health care services*. *Child mortality such as neonatal mortality, infant mortality, and under-5 mortality* which measure on whether a child aged (0-28 days), (0-12 months) and (0-59 months) is dead (1) or alive (0) for the model (1).

Utilization of health care service as tetanus injections before birth, assistance of nurse/ midwife, and assistance of traditional birth attendant which measure on whether children who received treatment yes (1) or no (0) for the model (2).

Independent variables

In this study, the independent variables are sex of child, place of residence, maternal age, education, wealth quintile, number of birth order, size of child, and region.

Sex of child shows that children who are female or male.

Place of residence represents whether the household of the child 0-59 months is in an urban or rural area.

Maternal age represents whether the age category of the mother at the time of delivery.

Education shows that parent who got level of education such as no education, primary, secondary, and higher, no education will be the reference category. The level of parental education can effect the utilization of health care service.

Wealth quintile (poor, middle, and rich) variable is an index of socioeconomic status. The socio-economic status of the household can affect utilization of health care services.

The Number of birth order that explains the individual woman's number of children. This category variable examines how many births can affect a child death and utilization of health care services.

Size of child represents how large or small size that measures on development of child health. This category variable finds how size can affect child death and utilization of health care service.

Region (Kachin, Kayah, Kayin, Chin, Sagaing, Taninthayi, Bago, Magway, Mandalay, Mon, Rakhine, Yangon, Shan, Ayeyarwaddy, and Naypyitaw) refers to the region where the child 0-59 months lives.

2.3 Statistical Analysis

This research attempts to estimate the overall effect of parental characteristics on child mortality. Since the independent variable is a binary variable, logistic regression is used to estimate the likelihood of child mortality and utilization of health care services.

The adapted logistic regression models can be expressed as follow:

Model (1) Analysis on the relationship between parental characteristics and child Mortality

$$\text{Child mortality}_{it} = \beta_0 + \beta_1 \text{Sex}_{it} + \beta_2 \text{Residence}_{it} + \beta_3 \text{Maternal_age}_{it} + \beta_4 \text{Education}_{it} +$$

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$$\beta_5 \text{Wealth_qui}_{it} + \beta_6 \text{Birth_order_number}_{it} + \beta_7 \text{Size_of_child}_{it} + \beta_8 \text{States_Regions}_{it} + \varepsilon_{it}$$

Model (2) Analysis on the relationship between parental characteristics and utilization of health care services

$$\begin{aligned} \text{Utilization of health care service}_{it} = & \alpha_0 + \alpha_1 \text{Residence}_{it} + \alpha_2 \text{Maternal_age}_{it} + \alpha_3 \text{Education}_{it} + \\ & \alpha_4 \text{Wealth_qui}_{it} + \alpha_5 \text{Birth_order_number}_{it} + \alpha_6 \\ & \text{Size_of_child}_{it} + \alpha_7 \text{States_Regions}_{it} + \mu_{it} \end{aligned}$$

where:

Child mortality is a dependent dummy variable which represents child death in the child i^{th} living in year t . (1= death and 2= alive)

Utilization of health care service is a dependent dummy variable which shows who received treatment with parental characteristics i^{th} living in year t . (1= yes and 0= no)

Sex_{it} is a dummy variable for individual child i^{th} (1=female and 2=male)

Residences_{it} is a dummy variable for the type of place of residence of individual child i^{th} (1= urban and 2= rural).

Maternal age_{it} is a category variable for age of the mother at the time of delivery of individual child i^{th} (1=<20, 2=20-29, 3=30-39, and 4=40-49).

Education_{it} is a category variable for level of parental education of individual i^{th} living in year t ((1= No education, 2=Primary, 3=Secondary, and 4=Higher).

Wealth_qui_{it} is a category variable for individual socio-economic factor as wealth quintile

that can affect utilization of health care delivery (1= poor, 2= middle, and 3= rich).

$\text{Birth order number}_{it}$ is a category variable for the number of births order for children i^{th} living in year t (1=<1, 2=2-3, 3=4-5, and 4=6+).

$\text{Size of child}_{it}$ is a category variable for the individual size that can affect utilization of health care service (1= larger, 2=Average, and 3= Smaller).

Region is a category variable for region of individual child i^{th} (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= Ayeyarwaddy Region, and 15= Naypyitaw). According to the 2015-2016 DHS Myanmar report, Kayah States was the lowest of under-5 child death. Therefore, Kayah States is the reference category.

ε_{it} and μ_{it} represent the error terms.

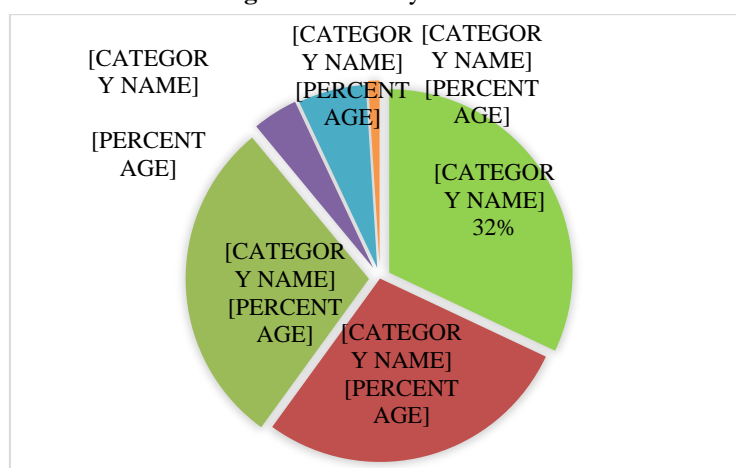
3. Results

3.1 Descriptive analysis

In order to support the government of Myanmar is preparing for the monitoring of the SDG indicators, the Central Statistical Organization under the Ministry of Planning and Finance and UNDP jointly examined in May 2016 the readiness and availability of Myanmar's data to measure the SDG indicators. In Myanmar, three-fifths of births are assisted by skilled providers (60%) that include nurses, midwives, and doctors; traditional birth attendants by 29%; auxiliary midwives by 6%; and relatives or friends by 4% according to the MMDHS 2015-2016 report in figure 1[7].

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Figure 1. Delivery assistance



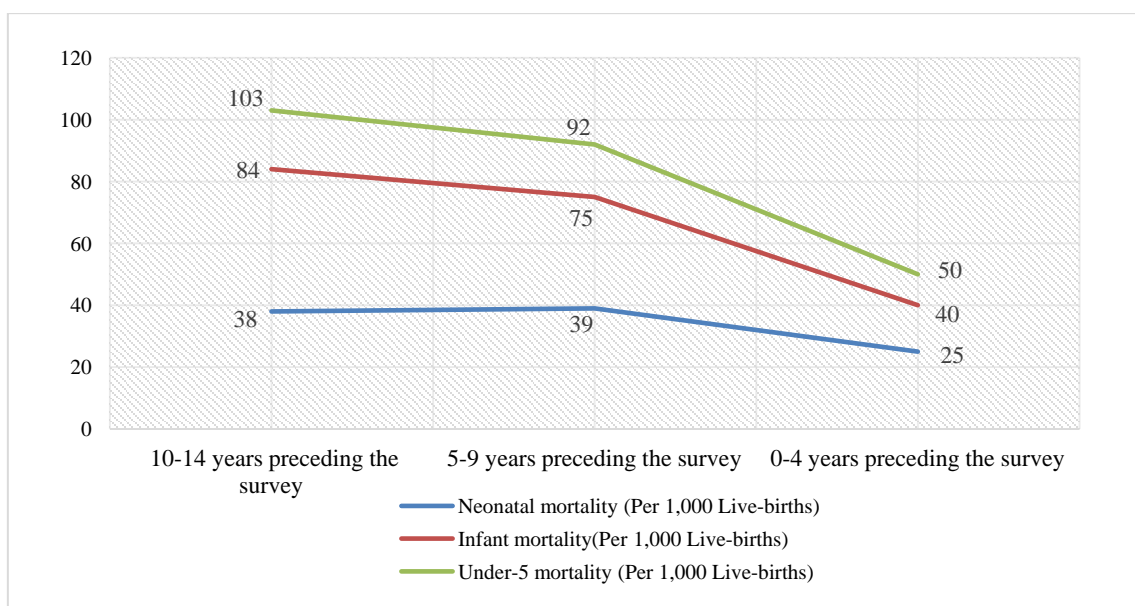
Source: 2015-2016 Demographic and Health Survey

Note: Precent distribution of birth in the 5 years before the survey

Skilled assistance during delivery as birth delivered with the assistance of doctors, nurses/midwives, or lady health visitors

Otherwise, MMDHS 2015-2016 report showed that under-5 mortalities is higher than infant mortality and neonatal mortality per 1,000 live births according to the 0-4 year preceding the survey in figure 2[7].

Figure 2. Trends in early childhood mortality rates



Source: 2015-2016 Demographic and Health Survey

Note: **Neonatal mortality**- the probability of dying within the first months of life

Infant mortality- the probability of dying between birth and the first birthday

Under-5 mortality- the probability of dying between birth and the fifth birthday

The research paper findings suggest a significantly negative relationship between parental characteristics and child mortality and a positive relationship between parental characteristics and utilization of health care services. According to the logistics regression estimation and hypothesis of results, these results will be expected statically significant. The potential sources of endogeneity are parent's ability, family income, lack health knowledge, and causes of child death in the logistics regression. Table 1 shows the

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outcome variables and factors of respondents (%).

Table 1. Outcome variables and factors of respondents

Factors	Respondents (%)(N=4,815)	Factors	Respondents (%)(N=4,815)
Outcome variables		Independent Variables	
Under 5 child mortality		Wealth quintile	
Alive	4597(95.47%)	Poor	2564(53.25%)
Dead	218(4.53%)	Middle	870(18.07%)
Infant child mortality		Rich	1381(28.68%)
Alive	4609 (95.72 %)	Number of birth order	
Dead	206 (4.28 %)	<1	1549(32.17%)
Neonatal child mortality		2-3	1951(40.52%)
Alive	4689 (97.38 %)	4-5	787(16.34%)
Dead	126 (2.62 %)	6+	528(10.97%)
Tetanus injections before birth		Size of child	
No	1540 (97.38 %)	Larger	1,119 (23.24%)
Yes	3275(68.02%)	Average	2,865 (59.51%)
Assistance: Nurse/ midwife		Smaller	830 (17.24 %)
No	2896 (60.15 %)	States & Regions	
Yes	1919 (39.85%)	Kachin	353 (7.33%)
Assistance: traditional birth attendant		Kayah	379 (7.87%)
No	3417 (70.97%)	Kayin	351(7.29%)
Yes	1398 (29.03%)	Chin	479(9.95%)
Independent Variables		Sagaing	348(7.23%)
Sex of child		Taninthayi	329(6.83%)
Female	2287 (47.50%)	Bago	280(5.82%)
Male	2528 (52.50%)	Magway	270(5.61%)
Place of Residence		Mandalay	268(5.57%)
Urban	1012(21.02%)	Mon	247(5.13%)
Rural	3803(78.98%)	Rakhine	357(7.41%)
Maternal age		Yangon	248(5.15%)
<20	379(7.87%)	Shan	351(7.29%)
20-29	2439(50.65%)	Ayeyarwaddy	314(6.52%)
30-39	1724 (35.80%)	Naypyitaw	241(5.01%)
40-49	273(5.67 %)		
Education			
No education	860 (17.86%)		
Primary	2132(44.28%)		
Secondary	1494(31.03%)		
Higher	329 (6.83 %)		

3.2 Bivariate Analysis and Multivariate Analysis

Model (1) The relationship between parental characteristics and child mortality by bivariate analysis

Table 2 shows the results of the logistic regression by bivariate analysis. The findings assume that there is a significant relationship between parental characteristics and child mortality.

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Table 2. Bivariate analysis of the relationship between parental characteristics and child mortality

Demographic and Parental Characteristics	Under Five Mortality		Infant Mortality		Neonatal Mortality	
	OR	CI	OR	CI	OR	CI
Sex of Child						
Female(Reference)	1		1		1	
Male	1.21	(0.84-1.75)	1.14	(0.78-1.66)	1.28	(0.77-2.13)
Place of residence						
Urban (Reference)	1		1		1	
Rural	1.65**	(1.01-2.69)	1.55*	(0.95-2.54)	1.55	(0.84-2.85)
Maternal age						
<20(Reference)	1		1		1	
20-29	1.13	(0.53-2.42)	1.07	(0.51-2.27)	1.47	(0.53-4.08)
30-39	1.42	(0.68-2.97)	1.29	(0.61-2.72)	1.62	(0.57-4.62)
40-49	1.80	(0.70-4.59)	1.62	(0.62-4.23)	1.72	(0.46-6.45)
Education						
No education(Reference)	1		1		1	
Primary	0.55**	(0.33-0.90)	0.55**	(0.34-0.90)	0.64	(0.34-1.19)
Secondary	0.39***	(0.22-0.68)	0.37***	(0.21-0.66)	0.48***	(0.25-0.94)
Higher	0.33**	(0.11-1.00)	0.35*	(0.12-1.06)	0.71	(0.23-2.22)
Wealth quintile						
Poor(Reference)	1		1		1	
Middle	0.74	(0.46-1.17)	0.67	(0.39-1.14)	0.83	(0.46-1.50)
Rich	0.43***	(0.26-0.71)	0.42***	(0.25-0.70)	0.04*	(0.30-1.06)
Number of birth order						
<1(Reference)	1		1		1	
2-3	1.27	(0.81-2.00)	1.31	(0.83-2.08)	1.38	(0.78-2.45)
4-5	2.26***	(1.21-4.22)	2.08**	(1.13-3.84)	1.80*	(0.89-3.64)
6+	2.94***	(1.61-5.36)	3.11***	(1.69-5.74)	2.81*	(1.25-6.35)
Size of child						
Larger(Reference)	1		1		1	
Average	1.03	(0.64-1.65)	0.92	(0.57-1.49)	0.90	(0.48-1.67)
Smaller	2.19***	(1.26-3.83)	2.21***	(1.26-3.88)	3.62***	(1.84-7.12)
Region						
Kayah(Reference)	1		1		1	
Chin	3.37***	(1.60-7.12)	3.28***	(1.58-6.83)	2.54**	(1.17-5.52)
Kayin	1.72	(0.68-4.41)	1.60	(0.63-4.10)	1.25	(0.37-4.22)
Kachin	1.30	(0.51-3.29)	1.18	(0.45-3.08)	1.06	(0.36-3.06)
Sagaing	1.43	(0.63-3.28)	1.20	(0.51-2.85)	1.36	(0.54-3.42)
Taninthayi	2.30*	(0.83-6.40)	2.04	(0.72-5.79)	0.68	(0.20-2.29)
Bago	1.36	(0.57-3.22)	1.36	(0.57-3.22)	1.36	(0.51-3.64)
Magway	1.31	(0.53-3.25)	1.16	(0.48-2.80)	1.06	(0.38-2.96)
Mandalay	1.88	(0.70-5.05)	1.72	(0.62-4.80)	1.12	(0.31-4.04)
Mon	1.23	(0.43-3.53)	1.07	(0.39-2.89)	0.73	(0.25-2.09)
Rakhine	1.17	(0.48-2.83)	1.17	(0.48-2.83)	1.33	(0.50-3.53)
Yangon	1.07	(0.33-3.44)	1.07	(0.33-3.44)	0.70	(0.13-3.82)
Shan	2.87***	(1.26-6.53)	2.72***	(1.23-6.00)	1.19	(0.46-3.08)
Ayeyarwaddy	1.74	(0.76-4.01)	1.61	(0.68-3.77)	1.28	(0.48-3.40)
Naypyitaw	1.50	(0.57-4.00)	1.50	(0.57-4.00)	0.88	(0.27-2.89)

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

Model (1) The relationship between parental characteristics and child mortality by multivariate analysis

Table 3 shows the results of the logistic regression by multivariate analysis. The findings assume that there is a significant relationship between parental characteristics and child mortality.

Table 3. Multivariate analysis of the relationship between parental characteristics and child mortality

Demographic and Parental Characteristics	Under Five Mortality		Infant Mortality		Neonatal Mortality	
	OR	CI	OR	CI	OR	CI
Sex of Child						
Female(Reference)	1		1		1	
Male	1.22	(0.84-1.77)	1.14	(0.78-1.68)	1.32	(0.79-2.21)
Place of residence						
Urban(Reference)	1		1		1	
Rural	0.96	(0.52-1.77)	0.89	(0.47-1.67)	1.08	(0.50-2.37)
Maternal age						
<20(Reference)	1		1		1	
20-29	1.05	(0.48-2.29)	0.97	(0.44-2.13)	1.19	(0.41-3.41)
30-39	1.04	(0.42-2.55)	0.91	(0.36-2.27)	0.97	(0.27-3.44)
40-49	0.97	(0.31-3.07)	0.83	(0.25-2.70)	0.71	(0.15-3.38)
Education						
No education(Reference)	1		1		1	
Primary	0.78	(0.47-1.29)	0.82	(0.50-1.35)	0.81	(0.43-1.53)
Secondary	0.75	(0.39-1.40)	0.73	(0.38-1.44)	0.78	(0.36-1.72)
Higher	0.90	(0.26-3.16)	1.01	(0.28-3.62)	1.57	(0.42-5.85)
Wealth quintile						
Poor(Reference)	1		1		1	
Middle	0.82	(0.49-1.38)	0.75	(0.42-1.34)	0.91	(0.45-1.83)
Rich	0.49**	(0.26-0.94)	0.46**	(0.24-0.92)	0.68	(0.29-1.59)
Number of birth order						
<1(Reference)	1		1		1	
2-3	1.17	(0.69-1.97)	1.25	(0.73-2.13)	1.41	(0.72-2.76)
4-5	1.86*	(0.86-4.10)	1.79	(0.82-3.90)	1.73	(0.66-4.54)
6+	2.23*	(0.96-5.15)	2.52**	(1.05-6.05)	3.00*	(1.00-9.44)
Size of child						
Larger(Reference)	1		1		1	
Average	1.10	(0.67-1.78)	0.97	(0.59-1.59)	0.94	(0.50-1.75)
Smaller	2.22***	(1.24-3.95)	2.26***	(1.25-4.06)	3.76***	(1.89-7.50)
Region						
Kayah(Reference)	1		1		1	
Chin	2.82***	(1.34-5.94)	2.68***	(1.29-5.58)	2.05*	(0.91-4.64)
Kayin	1.30	(0.52-3.25)	1.16	(0.45-2.97)	0.79	(0.22-2.86)
Kachin	1.26	(0.50-3.19)	1.11	(0.42-2.91)	0.89	(0.30-2.70)
Sagaing	1.51	(0.66-3.47)	1.26	(0.53-2.99)	1.30	(0.51-3.31)
Taninthayi	2.16*	(0.79-5.89)	1.85	(0.66-5.20)	0.59	(0.17-2.07)
Bago	1.50	(0.64-3.49)	1.46	(0.63-3.41)	1.41	(0.53-3.77)
Magway	1.32	(0.52-3.37)	1.16	(0.46-2.92)	1.03	(0.35-3.02)
Mandalay	2.35*	(0.85-5.88)	1.98	(0.73-5.40)	1.10	(0.33-3.68)
Mon	1.17	(0.43-3.19)	0.96	(0.37-2.48)	0.58	(0.20-1.65)
Rakhine	0.83	(0.33-2.12)	0.78	(0.31-2.00)	0.85	(0.28-2.52)
Yangon	1.54	(0.46-5.20)	1.52	(0.45-5.13)	0.92	(0.15-5.60)
Shan	2.69***	(1.22-5.96)	2.50**	(1.14-5.47)	1.02	(0.38-2.73)
Ayeyarwaddy	1.69	(0.73-3.95)	1.52	(0.64-3.60)	1.29	(0.46-3.64)
Naypyitaw	1.57	(0.56-4.41)	1.54	(0.55-4.36)	0.84	(0.23-3.06)

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

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According to the results of the bivariate analysis, there was a statistically significant association between child mortalities and parental characteristics such as place of residence, education, wealth quintile, number of birth order, size of child, and region. However, sex of child and maternal age were not significantly associated with child mortalities.

In spite of all variables were not statistically significant with the outcome variables were included in the multivariate analysis. Under-5 mortality and infant mortality were statistically significant higher level of wealth quintile as rich (OR: 0.49; 95% CI: 0.26-0.94; $p=0.033$ and OR: 0.46; 95% CI: 0.24-0.92; $p=0.060$) respectively. The risk of under-5 child mortality was significantly higher for 4-5 number of birth order (OR: 1.86; 90% CI: 0.86-4.10; $p=0.124$) and under-5 child mortality (OR: 2.23; 90% CI: 0.96-5.15; $p=0.061$), infant mortality (OR: 2.52; 95% CI: 1.05-6.05; $p=0.038$), and neonatal mortality (OR: 3.00; 90% CI: 1.00-9.44; $p=0.038$) were significant above six or more birth order number. The risk of under-5 child mortality, infant mortality, and neonatal mortality were strongly significant smaller for size of child (OR: 2.22; 99% CI: 1.24-3.95; $p=0.007$), (OR: 2.26; 99% CI: 1.25-4.06; $p=0.007$), and (OR: 3.76; 99% CI: 1.89-7.50; $p=0.000$) respectively.

Children such as under-5, infant, and neonatal born in Chin region (OR: 2.82; 99% CI: 1.34 -5.94; $p=0.006$), (OR: 2.68; 99% CI: 1.29 -5.58; $p=0.008$), and (OR: 2.05; 90% CI: 0.91-4.64; $p=0.083$); under-5 children born in Taninthayi region (OR: 2.16; 90% CI: 0.79 -5.89; $p=0.131$), Mandalay region (OR: 2.35; 90% CI: 0.85 -5.88; $p=0.102$); under- 5 and infant children born in Shan region (OR: 2.69; 99% CI: 1.22-5.96; $p=0.014$) and (OR: 2.50; 95% CI: 1.14-5.47; $p=0.022$) respectively were statistical significant associated with increased risk of childhood death compared with children born in Kayah region.

Model (2) The relationship between parental characteristics and utilization of health care service by bivariate Analysis

Table 4 shows the results of the logistic regression by bivariate analysis. The findings assume that there is a significant relationship between parental characteristics and utilization of health care services.

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Table 4. Bivariate analysis of the relationship between parental characteristics and utilization of health care services

Demographic and Parental Characteristics	Tetanus injections before birth		Assistance: Nurse/ midwife		Assistance: traditional birth attendant	
	OR	CI	OR	CI	OR	CI
Place of residence						
Urban(Reference)	1		1		1	
Rural	0.55***	(0.42-0.73)	0.54***	(0.41-0.70)	1.85***	(1.42-2.43)
Maternal age						
<20(Reference)	1		1		1	
20-29	1.92***	(1.46-2.51)	1.00	(0.76-1.31)	0.94	(0.70-1.28)
30-39	2.34***	(1.81-3.04)	1.02	(0.78-1.34)	0.84	(0.61-1.15)
40-49	2.30***	(1.53-3.47)	1.93	(0.62-1.38)	0.81	(0.52-1.26)
Education						
No education(Reference)	1		1		1	
Primary	2.38***	(1.68-3.72)	3.06***	(2.21-4.20)	0.49***	(0.35-0.68)
Secondary	4.01***	(2.79-5.75)	4.72***	(3.33-6.71)	0.15***	(0.10-0.22)
Higher	6.32***	(3.73-10.72)	5.23***	(3.40-8.05)	0.22***	(0.01-0.06)
Wealth quintile						
Poor(Reference)	1		1		1	
Middle	1.71***	(1.36-2.16)	1.60***	(1.28-2.01)	0.39***	(0.29-0.52)
Rich	2.44***	(1.78-3.36)	2.35***	(1.88-2.94)	0.08***	(0.06-0.11)
Number of birth order						
<1(Reference)	1		1		1	
2-3	1.12	(0.92-1.35)	0.81**	(0.68-0.95)	2.09***	(1.71-2.57)
4-5	0.70***	(0.55-0.91)	0.49***	(0.38-0.64)	3.81***	(3.00-4.84)
6+	0.55***	(0.38-0.79)	0.30***	(0.20-0.44)	5.05***	(3.54-7.20)
Size of child						
Larger(Reference)	1		1		1	
Average	0.88	(0.74-1.06)	0.94**	(0.78-1.12)	1.08	(0.87-1.33)
Smaller	0.74**	(0.57-0.96)	0.63***	(0.49-0.80)	1.66***	(1.26-2.18)
Region						
Kayah(Reference)	1		1		1	
Chin	0.55**	(0.34-0.90)	1.09	(0.55-2.15)	0.37***	(0.18-0.78)
Kayin	0.71	(0.38-1.31)	1.33	(0.62-2.83)	2.74**	(1.20-6.25)
Kachin	1.24	(0.79-1.93)	1.82*	(0.89-3.71)	1.22	(0.57-2.64)
Sagaing	1.27	(0.70-2.30)	2.86***	(1.32-6.59)	1.09	(0.43-2.77)
Taninthayi	0.87	(0.51-1.49)	2.94***	(1.06-4.01)	1.32	(0.52-3.35)
Bago	1.83***	(1.19-2.80)	2.06**	(0.91-3.86)	1.23	(0.61-2.50)
Magway	1.47*	(0.92-2.34)	1.87	(1.29-4.87)	0.91	(0.42-1.99)
Mandalay	2.09***	(1.34-3.25)	2.51***	(1.07-4.65)	0.52*	(0.24-1.12)
Mon	1.76***	(1.20-2.57)	2.23**	(0.44-2.18)	1.19	(0.55-2.53)
Rakhine	1.01	(0.60-1.70)	0.98	(1.44-2.18)	7.08***	(3.22-15.59)
Yangon	2.05***	(1.30-3.23)	4.02***	(1.94-8.29)	0.57	(0.23-1.44)
Shan	0.55*	(0.30-1.01)	0.85	(0.39-1.83)	1.56	(0.70-3.51)
Ayeyarwaddy	1.42	(0.88-2.29)	1.15	(0.60-2.20)	2.51***	(1.30-4.87)
Naypyitaw	1.61**	(1.00-2.57)	1.20	(0.58-2.48)	1.14	(0.54-2.43)

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

Model (2) The relationship between parental characteristics and utilization of health care service by multivariate Analysis

Table 5 shows the results of the logistic regression by multivariate analysis. The findings assume that there is a significant relationship between parental characteristics and utilization of health care services.

Table 5. Multivariate analysis of the relationship between parental characteristics and utilization of health care services

Demographic and Parental Characteristics	Tetanus injections before birth		Assistance: Nurse/ midwife		Assistance: traditional birth attendant	
	OR	CI	OR	CI	OR	CI
Place of residence						
Urban (Reference)	1		1		1	
Rural	1.05	(0.79-1.39)	0.96	(0.70-1.31)	1.91***	(1.16-3.14)
Maternal age						
<20(Reference)	1		1		1	
20-29	1.69***	(1.23-2.32)	1.00	(0.74-1.36)	0.68*	(0.46-1.01)
30-39	2.38***	(1.66-3.42)	1.26	(0.88-1.79)	0.35***	(0.22-0.57)
40-49	3.54***	(2.14-5.84)	1.93***	(1.18-3.18)	0.18***	(0.10-0.33)
Education						
No education(Reference)	1		1		1	
Primary	1.72***	(1.32-2.24)	2.10***	(1.58-2.80)	0.69***	(0.52-0.93)
Secondary	2.70***	(2.02-3.62)	2.54***	(1.84-3.51)	0.39***	(0.28-0.56)
Higher	2.88***	(1.72-4.81)	2.08***	(1.36-3.20)	0.17***	(0.07-0.41)
Wealth quintile						
Poor(Reference)	1		1		1	
Middle	1.37***	(0.08-1.74)	1.10	(0.87-1.41)	0.67***	(0.50-0.91)
Rich	1.78***	(1.27-2.49)	1.40***	(1.07-1.83)	0.22***	(0.15-0.33)
Number of birth order						
<1(Reference)	1		1		1	
2-3	1.14	(0.90-1.43)	0.81**	(0.67-0.98)	2.48***	(1.95-3.15)
4-5	0.81	(0.60-1.08)	0.54***	(0.40-0.73)	4.06***	(2.86-5.77)
6+	0.67*	(0.44-1.03)	0.34***	(0.21-0.56)	6.14***	(3.70-10.20)
Size of child						
Larger(Reference)	1		1		1	
Average	0.84*	(0.69-1.02)	0.83**	(0.69-1.00)	1.27**	(1.02-1.59)
Smaller	0.79*	(1.60-1.03)	0.62***	(0.48-0.80)	1.66***	(1.22-2.26)
Region						
Kayah(Reference)	1		1		1	
Chin	0.58**	(0.36-0.91)	1.25	(0.63-2.49)	0.24***	(0.10-0.57)
Kayin	0.84	(0.50-1.42)	1.60	(0.79-3.26)	2.57**	(1.11-5.92)
Kachin	1.10	(0.74-1.63)	1.68	(0.82-3.48)	1.39	(0.58-3.37)
Sagaing	1.15	(0.69-1.93)	2.72***	(1.24-5.93)	1.26	(0.46-3.48)
Taninthayi	0.91	(0.57-1.45)	3.09***	(1.41-6.74)	1.07	(0.40-2.87)
Bago	1.79***	(1.21-2.65)	1.85*	(0.94-3.63)	1.42	(0.62-3.27)
Magway	1.49*	(0.96-2.33)	1.83*	(0.88-3.80)	0.89	(0.37-2.13)
Mandalay	1.80***	(1.20-2.72)	2.18*	(1.07-4.42)	0.73	(0.30-1.78)
Mon	1.76***	(1.26-2.46)	2.16**	(1.04-4.49)	1.23	(0.57-2.65)
Rakhine	1.61**	(1.02-2.53)	1.36	(0.64-2.88)	5.24***	(2.28-12.05)
Yangon	1.53**	(1.01-2.32)	3.05***	(1.48-6.26)	1.34	(0.49-3.68)
Shan	0.71	(0.43-1.17)	1.01	(0.48-2.14)	1.33	(0.55-3.26)
Ayeyarwaddy	1.67**	(1.04-2.67)	1.14	(0.59-2.20)	2.33**	(1.07-5.06)
Naypyitaw	1.63**	(1.05-2.54)	1.12	(0.53-2.40)	1.21	(0.49-2.98)

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

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According to the results of the bivariate analysis, there was a statistically significant association between utilization of health care services and parental characteristics variables such as place of residence, maternal age, education, wealth quintile, number of birth order, size of child, and region. Regardless of all variables were statistically significant with the outcome variable were included in the multivariate analysis. Assistance of traditional birth attendant was strongly significant parent who living in urban (OR: 0.52; 99% CI: 0.32-0.86; $p=0.011$). Utilization of health care services such as tetanus injection before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were statically significant older of maternal age 40-49 (OR: 3.54; 99 % CI: 2.14-5.84; $p=0.039$), (OR: 1.93; 99 % CI: 1.18-3.18; $p=0.010$), and (OR: 0.18; 99 % CI: 0.10-0.33; $p=0.000$) respectively. Utilization of health care services such as tetanus injection before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were strongly significant all level of parental education; primary (OR: 1.72; 99% CI: 1.32-2.24; $p=0.000$), (OR: 2.10; 99 % CI: 1.58-2.80; $p=0.000$), and (OR: 0.69; 99 % CI: 0.52-0.93; $p=0.015$); secondary (OR: 2.70; 99% CI: 2.02-3.62; $p=0.000$), (OR: 2.54; 99 % CI: 1.84-3.51; $p=0.000$), and (OR: 0.39; 99 % CI: 0.28-0.56; $p=0.000$) and higher (OR: 2.88; 99% CI: 1.72-4.81; $p=0.000$), (OR: 2.08; 99 % CI: 1.36-3.20; $p=0.001$), and (OR: 0.17; 99 % CI: 0.07-0.41; $p=0.000$) respectively.

Utilization of health care services such as tetanus injection before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were strongly significant wealth quintile as rich (OR: 1.78; 99% CI: 1.27-2.49; $p=0.000$), (OR: 1.40; 99 % CI: 1.07-1.83; $p=0.013$), and (OR: 0.22; 99 % CI: 0.15-0.33; $p=0.000$) respectively. Utilization of health care services such as assistance of nurse/midwife and assistance of traditional birth attendant were significant number of birth order for 2-3 (OR: 0.81; 95 % CI: 0.67-0.98; $p=0.029$) and (OR: 2.48; 99 % CI: 1.95-3.15; $p=0.000$); 4-5 (OR: 0.54; 99 % CI: 0.40-0.73; $p=0.000$) and (OR:4.06; 99 % CI: 2.86-5.77; $p=0.000$) respectively; and above 6 number of birth order were statistically significant tetanus injection before birth (OR:0.67; 90 % CI: 0.44-1.03; $p=0.000$), assistance of nurse/midwife (OR: 0.34; 99 % CI: 0.21-0.56; $p=0.000$), and traditional birth attendant (OR: 6.14; 99 % CI: 3.70-10.20; $p=0.001$). Utilization of health care services such as tetanus injection before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were statistically significant size of child for average (OR: 0.84; 90% CI: 0.69-1.02; $p=0.000$), (OR: 0.83; 95 % CI: 0.69-1.00; $p=0.051$), and (OR: 1.27; 95 % CI: 1.02-1.59; $p=0.036$) and smaller (OR: 0.79; 90% CI: 1.60-1.03; $p=0.000$), (OR: 0.62; 99 % CI: 0.48-0.80; $p=0.000$), and (OR: 1.66; 99 % CI: 1.22-2.26; $p=0.001$) respectively.

Children who living in Chin region that were statistically significant tetanus injection before birth and assistance of traditional birth attendant (OR: 0.58; 95% CI: 0.36 -0.91; $p=0.035$) and (OR: 0.24; 99% CI: 0.10 -0.57; $p=0.001$); children who living in Kayin region was statistically significant assistance of traditional birth attendant (OR: 2.57; 95% CI: 1.11 -5.92; $p=0.027$); children who living in Sagaing and Taninthayi regions were strongly significant assistance of nurse/midwife (OR: 2.72; 99% CI: 1.24 -5.93; $p=0.012$) and (OR: 3.09; 99% CI: 1.41 -6.74; $p=0.005$); tetanus injection before birth and assistance of nurse/midwife were statistically significant children who living in Bago region (OR: 1.79; 99% CI: 1.21-2.65; $p=0.035$) and (OR: 1.85; 90% CI: 0.94-3.63; $p=0.073$); Magway region (OR: 1.49; 90% CI: 0.96-2.33; $p=0.035$) and (OR: 1.83; 90% CI: 0.88-3.80; $p=0.107$); Mandalay region (OR: 1.80; 99% CI: 1.20-2.72; $p=0.035$) and (OR: 2.18; 90% CI: 1.07-4.42; $p=0.107$); Mon region (OR: 1.76; 99% CI: 1.26-2.46; $p=0.035$) and (OR: 2.16; 95% CI: 1.04-4.49; $p=0.031$); tetanus injection before birth and assistance of traditional birth attendant were statistically significant children who living in Rakhine region (OR: 1.61; 95% CI: 1.02-2.53; $p=0.035$) and (OR: 5.24; 99% CI: 2.28-12.05); tetanus injection before birth and assistance of nurse/midwife

were statistically significant children who living in Yangon region (OR: 1.53; 95% CI: 1.01-2.32; p=0.035) and (OR: 3.05; 99% CI: 1.48-6.26; p=0.003); tetanus injection before birth and assistance of traditional birth attendant were statistically significant children who living in Ayeyarwaddy region (OR: 1.67; 95% CI: 1.04-2.67; p=0.035) and (OR: 2.33; 95% CI: 1.07-5.06); and tetanus injection before birth was statistically significant children who living in Naypyitaw region (OR: 1.63; 95% CI: 1.05-2.54; p=0.035) respectively.

4. Discussion

This study finds that there is a significant association between parental characteristics and mortalities; utilization of health care services among states and regions. This study found that sex of child was not statistically significant for the prediction of child mortality. The DHS working paper showed that sex of child was not statistically significant according to the logistics regression results[8]. This paper found that children living in the rural area were more likely to compare with the urban area for under-5 mortality and infant mortality that were statistically significant according to the bivariate analysis results. This could be due to poor access to well-equipped health facilities in rural areas. The living in rural who were more likely to be traditional health care facilities[9]. Utilization of health care services as assistance of traditional birth attendant was strongly significant in the urban area that less likely to compare with the rural area.

This paper found that maternal age category was not significant child mortalities such as under-5 mortality, infant mortality, and neonatal mortality according to the bivariate and multivariate analysis results. The relationship between maternal age and neonatal death was significant according to the multivariate analysis[10]. On the other hand, utilization of health care services was strongly significant maternal age category; 20-29, 30-39, 40-49 that more likely to utilize tetanus injection before birth compared with less than 20 years. This paper examined that maternal age was significantly associated with utilization of health care service as antenatal care services in place of residence[11].

This result gives clear evidence for the effect of parental education level on child mortalities such as under-5 mortality, infant mortality, and neonatal mortality according to the bivariate analysis results. This paper investigates that parental education impact health care utilization whether it assistances to reduce the cause of death[12]. A possible reason is that women who are educated have more knowledge and good health-seeking behaviour. The interaction term of the parent who seeks health care services that reduce child mortality, This study found that children of a parent who belong to wealth quintile as rich was statistically significant for the prediction of child mortalities according to the bivariate and multivariate analysis results. The parent who has a higher level of wealth quintile whether they go to utilize health care service that less likely to reduce child mortalities compared with the low level of wealth quintile. Wealth quintile has effect on access to health care services. But, research paper estimated that the association between the first wealth quintile as poor to more likely under-5 mortality rate[13].

This result gives clear evidence for the impacts of the birth order number on child mortality. According to the bivariate and multivariate analysis results, the parent has an increasing number of birth order less likely to the utilization of health care services that impact on child mortalities. According to the multivariate Regression Models' result, the number of births order 6+ with a short preceding interval had the highest risk of under-five mortality in Myanmar[14]. The smaller size of children was more likely to child mortality that was strongly significant according to the bivariate and multivariate analysis results. Otherwise, the smaller size of child received less likely to utilize health care services.

That result shows that hilly regions such as Chin State and Shan State are more likely to child mortality. The reasons are health issues as a poor community, poor roads, lack health care delivery, lack of health awareness, increasing children of women that impact will be increasing child mortality in hilly regions. Moreover, this study found that Mandalay Region is the third capital city as big urban area is more likely to under-5 child mortality. Because, the maternal mortality rate is higher in Mandalay region in accordance with Myanmar Statistical Year Book (2016), CSO.

The finding suggests that maternal mortality is associated with the risk of child mortality. Besides, the logistic regression shows that the positive significantly associated between the individual under-5 children of Tanintharyi Region and under-5 mortality. Children who living in Chin, Shan, and Mandalay regions that were statistically significant health care services which are less likely to utilize tetanus injection before birth and assistance of a traditional birth attendant. In spite of tetanus injections before birth, assistance of nurse/midwife, and assistance of traditional birth attendant were statistically significant children living in Kachin, Sagaing, Taninthayi, Bagon, Magway, Mandalay, Mon, Rakhine, Yangon, Shan, Ayeyarwaddy, and Naypyitaw regions that more likely to utilize health care services according to the bivariate and multivariate analysis results. However, the paper found that the significant relationship between tetanus injection before birth and neonatal mortality in under-5 mortalities. This result gives clear evidence for the effect of parental characteristics on child mortality[15].

4.1 Implication

The odds of child mortality are higher on those who did not access to health care when increasing birth order number and smaller size of child. In Myanmar, those living in rural areas lack awareness of health-seeking behaviour and access to health care delivery. On the other hand, most of those living in rural areas thought that distance to facilities is not a problem for health care. The rely on traditional healthcare/ cultural practices in the rural area. Wealth quintile has effect on access to health care services. Otherwise, the utilization of health care issues is the inadequate number of hospitals, lack of communications, and poor road network in the rural area. There have poverty, distance from health facilities, insufficient services, and low financial difficult for available health facilities. That issues will be able to receive an inadequate number of hospitals and skilled providers, lack of communications, and poor road network of rural community makes it difficult for available health facilities.

5. Conclusions

This study evaluates the effect of parental characteristics on child mortality among States and Regions. The logistic regression results show that the odds of child mortality increases with an increasing number of children, the smaller size of children, and less of wealth quintile. On the other hand, most of the parents are less interested in the utilization of health care services as their number of children increases. This implies that encouraging parent to seek their child in health care is not enough for a poor household. The parent who living in Chin, Shan, and Mandalay regions were lack of utilization of health care services, being a child was significantly associated with child mortality. In summary, finding results showed strong evidence of the success of the main findings. Therefore, policymakers need to target these factors in their effort to reduce under five child mortality. This study suggests that utilization of health care services as tetanus injections before birth, assistance of nurse/midwife, and assistance of traditional birth attendant are complex issue that

requires further research using the qualitative approach to understand the effect of parental characteristics on child mortality among states and region in Myanmar as well as explore the barriers to utilize health care services for parent.

Mothers and Children constitute 60% of the total population in Myanmar[16]. The government of Myanmar has given maternal and child health services as a priority in the national health plan. The Republic of the Union of Myanmar as a member state of the United Nations is working hard for reducing child mortality. Child health services are provided both in urban and rural settings. Child health section tried to reduce the under-5 mortality rate of 1990 to 2/3 in 2015 to achieve MDG-4 that was not yet on track to achieve from results of the 2015 World Bank: MDGs (Myanmar). The government of Myanmar also has to conduct MDGs through the targets of SDGs to develop social and economic sector by providing the quality of statistics that indicates “Better Data, Better Lives” for people of the world. The government will be able to require creating conducive health strengthening social sectors, provide good health to people with availability of health personnel and facility opportunities and provides better access to the productive assets and credit to the general people of the country.

5.1 Policy recommendation

The government will be able to require creating conducive health strengthening social sectors, to require upgrading awareness of health care services, and provide health facilities and credit to the general people of the country with health policy. The previous empirical evidence provided with this study not only contributes to the literature to support the relationship between parental characteristics and child mortality; utilization health care services but also provides information on policy-makers in Myanmar upon which to build enhancement of policies on the increase of MNCH services to reduce child mortality. The government is expected to focus more on the utilization of health care services on childhood mortality in rural areas. Additionally, policy-makers should pay more attention to the essence of child mortality by engaging in massive sensitization particularly in low-income households in rural and urban areas in Myanmar. The government will be able to give awareness of parental characteristics to utilize health care services.

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