Antenatal care services in decreasing under-five mortality

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Abstract

Objectives: the first five years of life are critical for children's physical and intellectual development. However, the under-five mortality rate in South Asia and ASEAN is relatively high, caused by complex etiologies. This paper identifies maternal high-risk fertility behaviors and healthcare services utilization and examines predictors of under-five mortality (U5M) in 7 Asian (South Asia - ASEAN) developing countries (Indonesia, Myanmar, Cambodia, Philippines, Bangladesh, Nepal, and Pakistan).

Methods: a multivariate logistic regression model with a complex survey was used to examine predictors of U5M on the frequency of U5M adjusted for comorbidities.

Results: according to multivariate models (model 2), U5M was 2.99 times higher in mothers with low weight at birth infants than in mothers without low weight at birth infants (aOR= 2.99; CI95%=2.49-3.58); Mothers without antenatal care contacts were 3.37 times more likely (aOR= 3.37; CI95%=2.83-4.00) to have a U5M than mothers with eight or more antenatal care contacts; U5M in Indonesia was 2.34 times higher (aOR= 2.34; CI95%= 1.89-2.89). It is investigated that antenatal care serves as a predictor in decreasing U5MR.

Conclusions: in order to achieve significant U5MR reduction, intervention programs that encourage antenatal care consultations should be implemented.

Key words *Under-five mortality, Demographic health survey, Antenatal care*

Introduction

Under-five mortality (U5M) is a term that refers to a child's death before reaching the age of 5 years old.[1] The first five years of life are critical for children's physical and intellectual development.[2] Child mortality rates are the leading indicators of population health and well-being. Many used it to determine population health and trends, including neonatal and post-neonatal, infant, child, and under-five mortality rates (U5MR).[3]

Globally, remarkable progress has been made in lowering child mortality, especially for children under five. In 2018, there were 5.3 million fewer deaths among children under five compared to an estimated 12.6 million in 1990. A total of 2.5 million (47%) deaths occurred in the first month of life, 1.5 million (29%) deaths happened between 1-11 months of age, and 1.3 million (25%) deaths occurred between 1-4 years of age.[4]

The U5M rate is still relatively high in South Asia, with a 15-year prevalence (1999-2014) of 100 deaths per 1,000 births. In 2015, the World Bank reported 53 deaths among children under-five in South Asia.[5] Neonatal (the first 28 days of life) and infant (first year) deaths contribute to most deaths among children under five, and the highest child death rates in the world are found in South Asia countries. Three out of ten child deaths worldwide happen in South Asia.[6]

In 2010, around 7.6 million children worldwide under five died.[1] Access to affordable interventions could prevent or treat over two-thirds of these early child fatalities. Pneumonia, diarrhea, malaria, and infant health complications are among the top five causes of death in children younger than five years old. Malnutrition contributes to more than a third of all child fatalities.[7] The probability of dying before five for children in low-income nations is roughly 18 times higher than in high-income countries. Child mortality has been affected by numerous variables, and among these variables, poverty is regarded as the most significant cause of world's child mortality.[8]

Most recent child deaths occur in South Asian countries, where the rates are 42.1% and 25.8% for U5M and neonatal mortality, respectively. After successfully implementing the Millennium Development Goals (MDG), the U5M rate in Bangladesh dropped dramatically, from 133 to 30.2 deaths per 1000 live births between 1990 and 2018. Bangladesh's rate is lower than Pakistan's (69.3 per 1000 live births) but still higher than the rest of South Asia (36.6 per 1000 live births).[9]

Over the last 30 years, ASEAN (Association of Southeast Asian Nations) – Indonesia, Malaysia, Singapura, Thailand, Philippines, Brunei Darussalam, Vietnam, Laos, Myanmar, and Cambodia, has seen significant neonatal and infant survival gains. Child deaths in the first 28 days of life (neonatal mortality) and U5M have been significantly reduced across the ASEAN region, with Thailand and Singapore reducing neonatal mortality by around 75% and Thailand reducing infant mortality in a similar proportion. ASEAN member countries have the triple challenge of lowering infant mortality, mother and child mortality, and maternal mortality. High infant mortality rates imply poor maternal and child health services, particularly during and after birth.[10]

Between 1980 and 2015, the U5MR in Indonesia fell from 85.4 to 22.2, the highest reported drop among ASEAN members. Indonesia had the greatest U5MR among the five ASEAN countries, followed by the Philippines.[11] According to Nguyen,[12] the drop in infant mortality rate is not quick enough for most Asian sub-regions, including Southeast Asia. The primary causes of child fatalities in ASEAN, in particular, are avoidable illnesses like diarrhea and pneumonia. Furthermore, it has been observed that neonatal (first month of life) infant mortality is increasing compared to children deaths in later childhood.

In developing nations, U5MR is brought on by complicated etiologies such as premature birth, suffocation, sepsis, injuries, measles, respiratory infection, and congenital disease. It is critical to note that the majority of child deaths are the result of maternal factors that can be avoided during pregnancy, such as illnesses that can be transmitted via the intrauterine pathway into the fetus' blood flow.[13]

A recent study conducted by Tai *et al.*[14] using the 2015-16 Myanmar Demographic Health Survey showed that there is an increased risk of death in children under-5 if antenatal care services which include skilled birth assistance, antenatal care, postnatal care, and tetanus vaccine are not used. Talukder *et al.*,[15] which conducted a study in Bangladesh, also stated that utilization of antenatal care services throughout pregnancy would unquestionably minimize the likelihood of child malnutrition and mortality, as well as maternal mortality and morbidity. Pregnancy problems can be detected at an early stage through antenatal care visits.[16] Meanwhile, medical experts can take action to stop or control potentially fatal bleeding or refer the patient to more advanced care if necessary. Babies have a better chance of survival if they are born in a facility with access to competent birth attendants and prenatal care.[17]

Various socioeconomic variables, maternal and child-related factors, and health service utilization factors, such as household wealth status; educational level of the mother; older maternal age; use of polluting fuel; higher parity; lack of antenatal care (ANC) visits; lack of skilled birth attendance; use of antenatal iron and folic acid (IFA) supplementation; and tetanus toxoid (TT)

vaccination during pregnancy, were identified as major factors associated with childhood mortality.[18] In addition, other studies have highlighted the importance of variables at both community and individual levels for the survival of children. For a more accurate estimate and beneficial epidemiological understanding, these studies suggest incorporating variables at the community level.[19]

This study identifies maternal high-risk fertility behaviors effects and healthcare services utilization. It examines the predictor of U5M in 7 Asian (South Asia and ASEAN) developing countries.

Methods

This cross-sectional study used secondary data from Demographic and Health Surveys (DHS) (2014–2018) (freely available to the public) to determine the primary predictor of U5M. The DHS is a nationally representative survey conducted every five years in low- and middle-income countries. This paper focused on seven countries with recent DHS data to evaluate mortality predictors for children under five years. Countries were included if they provided complete data on all variables and had current DHS data (2014–2018). The included nations were South Asian and ASEAN countries; Indonesia, Myanmar, Cambodia, Philippines, Bangladesh, Nepal, and Pakistan. The multivariate logistic regression model was used to examine the predictor of U5M on the occurrence of U5M adjusting with confounders.

The study's population consisted of women aged 15 to 49 who had given birth within the prior five years. Eligibility criteria of women were excluded from the analysis if the information on maternal and infants was missing. Following DHS procedures, weightings were applied to achieve objective values. The absence of weights can cause results to be biased toward the oversampled subpopulations. Therefore, the study sample comprised a weighted sample of 66,405 women. The DHS sample technique and data collection procedures are described elsewhere.

Study variables included health care services (i.e., delivery of health care, ANC visits, contraceptive use, and delivery by cesarean section), Infants' characteristics (i.e., gender and status of low birth weight - LBW); LBW status was defined as a birth weight of less than 2500 g. Maternal characteristics (i.e., age of mothers at childbirth, maternal occupation, educational attainment, and parity). Household characteristics (i.e., family size and socioeconomic status); the socioeconomic status of families was assessed by assessing the yearly household expenditures. Socioeconomic status was classified into five categories using quintiles. Based on information about household assets, asset wealth indices, which are constructed using principal component analysis, provide data on economic status. According to the results, the poor were categorized into the two lowest quintiles, while the highly wealthy were classified into the highest quintile. The survey also provides varieties of home (urban or rural) and regional (south Asian and ASEAN developing countries). The authors are interested in U5M as an outcome variable. Based on the definition of U5M (child will die before reaching five years of age), children were categorized as either under-five mortalities (Yes, coded 0) or non-under-five mortalities (No, coded 1).

The ethical practices were the responsibility of the organizations that sponsored, funded, or managed the surveys. Intermediate Care Facilities (ICF) International approves all DHS surveys and an Institutional Review Board (IRB) in the respective country to ensure that the protocols adhere to the US Department of Health and Human Services regulations for human subject protection.

The analyses were conducted with SPSS Version 28 licensed by Faculty of Public Health, Universitas Muhammadiyah Jakarta. All analyses adjusted for the complex survey design structure (clustering, weighting, and stratification). Descriptive statistics were computed for the independent and outcome variables. The authors combined the datasets of whole countries to produce a single dataset, resulting in a sample size of 66,640 women aged 15 to 49. The sample was stratified by country: Bangladesh (8,756), Pakistan (12,690), Nepal (5,038), Myanmar (4,784), Cambodia (7,126), the Philippines (10,530), and Indonesia (17,716). Using multivariate logistic regression models, factors related with U5M in South Asian and ASEAN developing countries were investigated. The regression analysis findings were provided as adjusted odds ratios (aOR) with 95% confidence intervals (CI), indicating statistical significance. The authors calculate U5M rate per country using the live birth as denominator.

Results

Tables 1 and 2 show U5M characteristics among mother-child pairs, and the study included 66,640 mother-child pairs from South Asian and ASEAN developing countries. In seven countries, most U5M (46.2%-72.3%) were born to mothers with three or more children. Mothers who were not contacted by an antenatal care provider during their pregnancy had a 47.6%-70.93% U5MR. 75.4-96.0 % of U5M occurred via cesarean section. The Philippines and Indonesia are the only countries with a high proportion of secondary school graduates (25.9%-26.0%), while other countries have a high proportion of low-level secondary school graduates. The majority were from rural areas (86.1%-48.6%). Based on total children born in each country, the majority of U5M was seen in South Asia; Pakistan (5.7%), Bangladesh (4.1%), Nepal (3.5%); and

ASEAN countries; Myanmar (4.6%), Indonesia (2.7%), Cambodia (2.7%), and The Philippines (2.4%).

Table 3 includes all of the characteristics that have been identified as essential determinants of U5M in various studies. All aspects shown in Table 2 were included in the multiple regression analysis in the pooled data (Model 1; Model 2). Although socioeconomic status, cesarean delivery, and type of residence are not statistically significant, their effects are associated with U5M once other variables in the conceptual framework are controlled for, such as the survey indicator. According to multivariate models (model 2), girls are 1.24 times more likely to experience U5M than boys (aOR= 1.24; CI95%= 1.14-1.35). Children with LBW were 2.99 times more likely to experience U5M than normal weight birth (aOR= 2.99; CI95%= 2.49-3.58; *p*<0.0001). Mothers

Table 1

Characteristics of U5M in South Asian and ASEAN Developing Countries, 2014-2018.

Variables	South Asian and ASEAN Developing countries (N= 66,640)		Under-five Mortality (U5M)					
			South Asian					
			Bangladesh (N=357)		Nepal (N=177)		Pakistan (N=718)	
	n	%	n	%	n	%	n	%
Infants characteristics								
Child's gender								
Girl	34,459	51.7	194	54.3	84	47.5	392	54.6
Boy	32,181	48.3	163	45.7	93	52.5	326	45.4
LBW status								
Yes	3,908	5.9	22	6.2	12	6.8	15	2.1
Don't know	26,213	39.3	296	82.9	109	61.6	641	89.3
No	36,519	54.8	39	10.9	56	31.6	62	8.6
Maternal characteristics								
Age of mothers at childbirth (years)								
<20	8,869	13.3	130	36.4	62	35.0	93	13.0
>35	6,845	10.3	6	1.7	8	4.5	66	9.2
20 - 35	50,926	76.4	221	61.9	107	60.5	559	77.9
Maternal Occupation								
Not working	35,420	53.2	197	55.2	68	38.4	591	82.3
Working	31,220	46.8	160	44.8	109	61.6	127	17.7
Educational attainment								
No education	11,183	16.8	34	9.5	72	40.7	430	59.9
Incomplete elementary	9,466	14.2	82	23.0	20	11.3	38	5.3
Complete elementary	8,058	12.1	44	12.3	13	7.3	70	9.7
Incomplete high school	16,088	24.1	145	40.6	50	28.2	76	10.6
Complete high school	11,163	16.8	19	5.3	10	5.6	53	7.4
Higher	10,682	16.0	33	9.2	12	6.8	51	7.1
Parity								
3 or more	30,428	45.7	165	46.2	95	53.7	519	72.3
1-2	36,212	54.3	192	53.8	82	46.3	199	27.7
Household characteristics								
Family size (persons)								
1- 4	48,087	72.2	207	58.0	120	67.8	604	84.1
5 or more	18,553	27.8	150	42.0	57	32.2	114	15.9
Socioeconomic status								
Poorest	18,117	27.2	93	26.1	56	31.6	196	27.3

Poorer	14,127	21.2	71	19.9	44	24.9	188	26.2
Middle	12,154	18.2	66	18.5	33	18.6	138	19.2
Richer	11,422	17.1	70	19.6	33	18.6	112	15.6
Richest	10,820	16.2	57	16.0	11	6.2	84	11.7
Health care services							
Delivery of health care							
Non health care	19,745	29.6	89	24.9	89	50.3	254	35.4
Health care	46,895	70.4	268	75.1	88	49.7	464	64.6
Antenatal care contacts							
None	19,907	29.9	253	70.9	107	60.5	444	61.8
1-7	31,739	47.6	94	26.3	68	38.4	231	32.2
≥ 8	14,994	22.5	10	2.8	2	1.1	43	6.0
Contraceptive use							
No	28,973	43.5	166	46.5	123	69.5	529	73.7
Yes	37,667	56.5	191	53.5	54	30.5	189	26.3
Delivery by cesarean section							
Yes	11,035	16.6	269	75.4	170	96.0	588	81.9
No	55,605	83.4	88	24.6	7	4.0	130	18.1
Community characteristics							
Residence							
Rural	40,164	60.3	230	64.4	86	48.6	443	61.7
Urban	26,476	39.7	127	35.6	91	51.4	275	38.3

Total under-five children from South Asian countries consist of Bangladesh; n=357 (4.1%), Nepal; n=177 (3.5%), Pakistan; n=718 (5.7%) of total children births in each country.
LBW = low birth weight.

Table 2

Characteristics of U5M in ASEAN Developing Countries, 2014-2018.

	Under-five Mortality (U5M)							
	ASEAN developing countries							
Variables	**Indonesia (N = 483)**		**Myanmar (N = 218)**		**The Philippines (N = 254)**		**Cambodia (N = 194)**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Infants characteristics								
Child's gender								
Girl	291	60.2	126	57.8	141	55.5	113	58.2
Boy	192	39.8	92	42.2	113	44.5	81	41.8
LBW status								
Yes	57	11.8	6	2.8	31	12.2	37	19.1
Don't know	185	38.3	185	84.9	128	50.4	74	38.1
No	241	49.9	27	12.4	95	37.4	83	42.8
Maternal characteristics								
Age of mothers at childbirth (years)								
<20	48	9.9	17	7.8	27	10.6	21	10.8
>35	100	20.7	44	20.2	57	22.4	33	17.0
20 - 35	335	69.4	157	72.0	170	67.0	140	72.2
Maternal Occupation								
Not working	180	37.3	60	27.5	113	44.5	44	22.7
Working	303	62.7	158	72.5	141	55.5	150	77.3

Educational attainment							
No education	24	5.0	58	26.6	9	3.5	48	24.7
Incomplete elementary	61	12.6	53	24.3	60	23.6	79	40.7
Complete elementary	83	17.2	45	20.6	33	13.0	15	7.7
Incomplete high school	111	23.0	49	22.5	36	14.2	50	25.9
Complete high school	125	25.9	5	2.3	66	26.0	0	0.0
Higher	79	16.4	8	3.7	50	19.7	2	1.0
Parity							
3 or more	281	58.2	155	71.1	176	69.3	112	57.7
1-2	202	41.8	63	28.9	78	30.7	82	42.3
Household characteristics							
Family size (persons)							
1- 4	239	49.5	138	63.3	157	61.8	110	56.7
5 or more	244	50.5	80	36.7	97	38.2	84	43.3
Socioeconomic status							
Poorest	183	37.9	77	35.3	105	41.3	76	39.2
Poorer	88	18.2	61	28.0	66	26.0	44	22.7
Middle	65	13.5	44	20.2	41	16.1	24	12.4
Richer	85	17.6	19	8.7	23	9.1	29	14.9
Richest	62	12.8	17	7.8	19	7.5	21	10.8
Health care services							
Delivery of health care							
Non health care	166	34.4	166	76.1	93	36.6	54	27.8
Health care	317	65.6	52	23.9	161	63.4	140	72.2
Antenatal care contacts							
None	226	46.8	140	64.2	121	47.6	113	58.2
1-7	138	28.6	70	32.1	104	40.9	73	37.2
≥ 8	119	24.6	8	3.7	29	11.4	8	4.1
Contraceptive use							
No	228	47.2	133	61.0	131	51.6	114	58.8
Yes	255	52.8	85	39.0	123	48.4	80	41.2
Delivery by cesarean section							
Yes	414	85.7	206	94.5	216	85.0	183	94.3
No	69	14.3	12	5.5	38	15.0	11	5.7
Community characteristics							
Residence							
Rural	266	55.1	186	85.3	183	72.0	167	86.1
Urban	217	44.7	32	14.7	71	28.0	27	13.9

Total under-five children from ASEAN developing countries consist of Indonesia; n=483 (2.7%), Myanmar; n=218(4.6%); The Philippines; n=254 (2.4%); Cambodia; n=194 (2.7%) of total children births in each country.
LBW = low birth weight.

whose age was less than 20 years had a significantly higher experience U5M than mothers from the age group 20–35 years (aOR=1.53, CI95%= 1.35-1.75; *p*<0.0001). Mothers with parity 3+ (three or more) were 2.24 more likely to experience U5M than mothers who had parity 1-2. Mothers without ANC contacts were 3.37 times more likely (aOR= 3.37; CI95%=2.83-4.00) to have U5M than mothers with eight or more ANC contacts. U5M was 2.99 times higher in mothers with LBW infants than in mothers without LBW infants (aOR= 2.99; CI95%=2.49-3.58). U5M in Indonesia was 2.34 times higher (aOR=2.34; CI95%= 1.89-2.89) compared with Nepal.

Table 3

Multivariate models showing factors associated with U5M, 2014-2018.

Variables	Model I			Model II		
	Sig.	aOR	CI95%		Sig.	aOR	CI95%	
Infants characteristics						
Child's gender						
Girl	<0.0001	1.24	1.14	1.35	<0.0001	1.24	1.14	1.35
Boy		1.00				1.00	
LBW status						
Yes	<0.0001	2.97	2.48	3.56	<0.0001	2.99	2.49	3.58
Don't know	<0.0001	3.60	3.02	4.29	<0.0001	3.63	3.05	4.32
No		1.00				1.00	
Maternal characteristics						
Age of mothers at childbirth (years)						
<20	<0.0001	1.52	1.33	1.73	<0.0001	1.53	1.35	1.75
>35	<0.0001	1.31	1.14	1.50	<0.0001	1.32	1.15	1.51
20 - 35		1.00				1.00	
Maternal Occupation						
Not working	<0.0001	0.74	0.67	0.81	<0.0001	0.74	0.67	0.82
Working		1.00				1.00	
Educational attainment						
No education	0.327	1.11	0.90	1.37	-	-	-	-
Incomplete elementary	0.157	1.16	0.94	1.43	-	-	-	-
Complete elementary	0.111	1.18	0.96	1.45		-	
Incomplete high school	0.095	1.16	0.97	1.39	-	-	-	-
Complete high school	0.282	1.11	0.92	1.35	-	-	-	-
Higher		1.00				-	
Parity						
3 or more	<0,0001	2,19	1,94	2,48	<0,0001	2,24	1,98	2,53
1- 2		1,00				1,00	
Household characteristics						
Family size						
4 or more	<0.0001	2.19	1.94	2.48	<0.0001	2.24	1.98	2.53
< 4		1.00				1.00	
Socioeconomic status						
Poorest	0.042	0.81	0.67	0.99	0.036	0.84	0.71	0.99
Poorer	0.608	0.95	0.80	1.14	0.778	0.98	0.83	1.15
Middle	0.570	0.95	0.79	1.14	0.738	0.97	0.82	1.15
Richer	0.653	1.04	0.87	1.25	0.512	1.06	0.89	1.26
Richest		1.00				1.00	
Health care services						
Delivery of health care						
No	<0.0001	0.73	0.65	0.83	<0.0001	0.72	0.64	0.82
Yes		1.00				1.00	
Antenatal care contacts						
None	<0.0001	3.38	2.85	4.02	<0.0001	3.37	2.83	4.00

	p	OR			p	OR		
1-7	<0.0001	1.41	1.20	1.67	<0.0001	1.42	1.20	1.67
≥ 8		1.00				1.00		
Contraceptive use								
No	<0.0001	1.67	1.52	1.83	<0.0001	1.66	1.51	1.82
Yes		1.00				1.00		
Delivery by cesarean section								
Yes	0.176	1.10	0.96	1.27	-	-	-	-
No		1.00				-		
Community characteristics								
Residence								
Rural	0.874	1.01	0.90	1.13	-	-	-	-
Urban		1.00				-		
Countries								
Pakistan	<0.0001	1.60	1.34	1.91	<0.0001	1.53	1.30	1.82
Indonesia	<0.0001	2.40	1.93	2.98	<0.0001	2.34	1.89	2.89
Bangladesh	<0.0001	1.53	1.21	1.93	0.001	1.48	1.19	1.85
The Philippines	0.012	1.33	1.07	1.67	0.025	1.28	1.03	1.58
Myanmar	<0.0001	1.59	1.27	1.99	<0.0001	1.57	1.26	1.96
Cambodia	<0.0001	1.77	1.37	2.28	<0.0001	1.75	1.38	2.23
Nepal		1.00				1.00		

LBW = low birth weight.

Discussion

Children with second or third birth order (OR = 1.316; CI95%=1.097-2.343), fourth or fifth birth order (OR = 1.934; CI95%=1.678- 3.822), and sixth or above birth order (OR = 3.980; CI95%=2.352-6.734) were significantly associated with increased risk of under-five mortality relative to those with first birth order.[20] This agrees with the findings of the previous investigation. Children with a higher birth order had a higher risk of under-five mortality than those with a lower birth order.[21,22] The reason for this might be that given the number of children a mother has, the care she provides to each child decreases. It was discovered that children from larger families were more likely to pass away before the age of 5 than those from smaller families.[20]

This aligns with previous research findings by Gebretsadik and Gabreyohannes[23] which may be due to the fact that as the size of the family increases, the proportion of food and other limited resources necessary for child survival decreases. Multiple births were associated with an increased risk of infant mortality compared to single pregnancies. Possible explanations include the sharing of consumables and other limited resources, as well as the care provided by mothers to their children.[23,24]

The odds of U5M increased by 31% in children with low birth weight compared to children with normal birth weight.[22] This is similar to the findings of previous a previous research by Ahinkorah *et al.*,[25] which found that children who were very little at birth had a greater under-five mortality rate (207 deaths per 1,000 live births) than those who were larger than normal at birth (102 deaths per 1,000 live births).

According to Aheto's research in Ethiopia, female babies were 1.31 times more likely to die before reaching the age of five.[24] Newborn girls have a biological advantage in survival over newborn boys because they are less vulnerable to perinatal conditions (such as birth trauma, intrauterine hypoxia and birth asphyxia, prematurity, respiratory distress syndrome, and neonatal tetanus), congenital anomalies, and infectious diseases such as intestinal infections and lower respiratory infections. However, girls do not have the same advantage regarding some infectious diseases, which are the leading causes of death in later infancy and early childhood in environments with high general mortality. As a result, the sex ratio of child mortality is lower than the sex ratio of infant mortality. The sex ratio of under-five mortality is in the middle, and the relative mortality levels of the baby and child age groups determine it.[22]

Large family sizes have been linked to a decrease in child mortality. Families with seven or more members were 0.49 times (aOR = 0.49; CI95%= 0.29-0.80) or (51%), and families with four to six members were 0.65 times (aOR = 0.65; CI95%= 0.41-0.92) or (35%), less likely to have a child that dies than families with three or fewer members. It could be because when household members are prominent, mothers have more time to care

for their children, lowering child mortality. However, from an economic standpoint, additional research is required because households with large family sizes need adequate access to essential requirements and services such as clean water, food, education, and health.[26]

Tagoe et al.[27] discovered that compared to children of mothers who used a modern type of contraception, children of mothers who were non-users of contraception but expected to use it later were less likely to die before the age of five. There is a low incidence of modern contraceptive usage among reproductive-age women in Sierra Leone. Hence using modern contraceptives does not influence under-five mortality. Another possible explanation is that mothers, who are currently non-users but intend to use contraception later, may have had their ideal number of surviving children and may be making plans for childbirth control, which could explain why their children were less likely to die.

Using data from demographic health surveys among seven developing south Asian and ASEAN nations, the authors also investigated the impact of ANC visits on child health outcomes, specifically U5M mothers without ANC contacts were 3.37 times more likely to have a U5M than mothers with eight or more ANC contacts. U5M was 2.99 times higher in mothers with LBW infants than mothers without LBW infants. Our study also investigated that U5M in Indonesia was 2.34 times higher among 7 South Asia and ASEAN developing countries. It is in line with the report from World Health Organization (WHO) (2020) that Indonesia ranks seventh in the world and is the only Southeast Asian country that is included in the world ranking for U5M, with an anticipated 115 deaths in 2019, surpassing the United Republic of Tanzania, Angola, and Bangladesh.

Infant and child mortality risk factors include the number of ANC visits. Children born to mothers who had fewer than the required ANC visits were more likely to die than children born to women who had the recommended visits.[28] WHO advises at least eight contacts, including one in the first trimester, five in the third trimester, and two in the second trimester. ANC offers the opportunity to deliver information to pregnant women, manage existing social and medical issues, and check for risk factors.

This study aligns with several kinds of research conducted in low- and middle-income countries. Abir et al.[29] conducted a cross-sectional study in Bangladesh using multivariate logistic regression to analyze three demographic health surveys and discovered that women who had ANC visits had a lower risk of U5M. Arunda et al.[30] investigated the impact of antenatal care services on neonatal mortality in Kenya. Based on a binary logistic regression, their findings show that mothers who attended ANC visits had the lowest neonatal mortality

rates.[30] Another study by Tai et al.,[14] using the Myanmar Demographic Health Survey 2015-16 found that children whose mothers used ANC facilities such as government hospitals, private hospitals, and mobile clinics had a considerably lower risk of mortality.[14]

Furthermore, compared to children whose mothers did not get ANC, those born to mothers who did have a lower chance of death. Despite being at odds with the findings of other studies, this one agrees with the Ethiopian study. Mothers who have ANC visits and other forms of maternal health care may be better able to protect their infants from illness by learning about proper feeding techniques and other preventative measures. In addition, mothers who go to ANC may be more likely to get postnatal care, which is crucial for early spotting health issues in children and acting on them effectively. ANC visits may be advantageous for both the infant and the mother. ANC is an opportunity to promote good behavior and parenting skills, which are especially crucial for new mothers.

In addition, ANC is a well-established process that helps to identify problems related to maternal morbidity and mortality through relevant physical examinations. Fewer issues connected to maternal health have occurred in those who have obtained a minimum number of ANC services from health professionals in various government and non-government facilities, resulting in a reduction in maternal morbidity and mortality.

This study is one of the first to investigate the risk factors of U5M in 7 developing south Asian and ASEAN nations, especially in Indonesia as the highest U5M. The U5MR of Indonesian children suggests a drop but still sluggish development despite the SDGs' additional measures.

The limitation of this study is the fact that the antenatal health care utilization in the DHS was self-reported. It may have been influenced by social desirability within the society where the women lived. Furthermore, ANC attendance was assessed for births that took place in the years prior to the study, which could have been affected by recall bias. The definition of ANC may vary from nation to country and may not always require treatment from trained health professionals, therefore the outcome should be assessed in this perspective. Since the data is cross-sectional, causal inference is constrained. Furthermore, authors may also wish to consider data on missing LBW. In addition to this, a significant portion of the children did not have their birth weight recorded. The current findings may be affected by such missing values.

The paper investigated that ANC functions as a predictor in decreasing U5MR. ANC visits on child health outcomes, specifically U5M mothers without ANC contacts, were 3.37 times more likely (aOR= 3.37; CI95%=2.83-4.00) to have a U5M than mothers with

eight or more ANC contacts. Intervention initiatives that promote more prenatal care visits must be taken into consideration if the goal is to significantly lower the U5MR. It will increase child survival and contribute in achieving the aims of the Sustainable Development Goals.

Authors' contribution

Hastono SP made a substantial contribution to the conception and design of the investigation, and writing of the article. Lusida N made a significant contribution to the study's conception, design, and data collection. Arinda YD, Arsyi M and Andriyani made major contributions to the manuscript's critical evaluation. Each author equally agreed to be responsible for all aspects of the work after reading and approving the final draft before it was released. All authors declare no conflicts of interest.

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