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Determinants of Under-Five Mortality in Khartoum State

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Abstract

This paper aims to study the determinants of under-five mortality in Khartoum state the capital state of Sudan. Primary data on variables of relevance to under-five mortality was collected from a random sample of households in Khartoum state in 2018, and analyzed by using binary logistic regression technique where dying or not dying before reaching age 5 constituted the dependent variable. The resulting model revealed that the strongest predictors of under-five mortality are age of mother , age at the first childbearing, numbers of medical checkup, duration of pregnancy less than 32 weeks, average of breastfeeding, and mother suffers from diabetes. Under-five mortality in Khartoum state can thus be reduced quite considerably by positively addressing these determinants via orchestrated policy .

Keywards : Under-fiveMortality , Binary Logistic Regression , Determinants

المستخلص:

نهدف هذه الورقة الى دراسة محددات وفيات الأطفال دون الخامسة من العمر في ولاية الخرطوم عاصمة السودان . اعتمدت الورقة على البيانات الاولية التي لها علاقة بوفيات الاطفال دون الخامسة بواسطة عينة عشوائية من اسر ولاية الخرطوم في العام 2018 ولقد تم تحليل هذه البيانات باستخدام اسلوب التحليل اللوجستية الثنائي حيث وجود حالة موت او لا للأطفال دون الخامسة من العمر يمثل المتغير التابع . وكشف النموذج ان اقوى المتغيرات التي تساعد على تنبؤ وفيات الاطفال دون الخامسة من العمر هي عمر الام وعمر الام عن انجاب اول طفل وعدد مرات مراجعة الطبيب خلال فترة الحمل ومتوسط الرضاعة الطبيعية ومدة الحمل اقل من 32 اسبوع ومعاناة الام من مرض السكرى ويمكن خفض وفيات الاطفال دون الخامسة من خلال سياسيات حكومية تعمل على معالجة هذه المحددات بشكل إيجابي .

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1-Background

Child mortality is one of important indicators of public health and it reflects the socio-economic and environmental condition as well as the development of countries. Whereas country conditions are known to influence under-five mortality, it is unknown whether these have a different impact on the poor and the rich persons. Also Under-five mortality increase is not only undesirable but also indicative of a decline in general living standard. Data indicate that globally under-five mortality has dropped from nearly 12 million in 1990 to 6.9 million in 2011. (UNICEF, 2011)

Globally, under-five mortality rate has decreased by 58%, from an estimated rate of 93 deaths per 1000 a live births in 1990 to 39 deaths per 1000 a live births in 2017. This is equivalent to 1 in 11 children dying before reaching age 5 in 1990, compared to 1 in 26 in 2017(WHO,2017)

Globally, in 2017, half of all deaths under 5 years of age took place in sub-Saharan Africa, and another 30% in Southern Asia. In sub-Saharan Africa, 1 in 13 children died before the fifth day after their birth. In high-income countries, that number was 1 in 185. (WHO, 2017)

By the end of the Millennium Development Goals (MDGs) era, the international community agreed on a new framework – the Sustainable Development Goals (SDGs) by the target is to end preventable deaths of newborns and children less than 5 years of age. The goal is all countries aiming to reduce under-five mortality to at least as low as 25 per 1000 live births. 117 Member States already met the SDG target on under-five mortality, and 26 countries are expected to meet the target by 2030, if current trends continue. (WHO, 2017).

The 20th century witnessed dramatic slow decline in under-five mortality in Sudan. Table (1) shows a decrease of under-five mortality rate for selected years 1970, 1990, 2000, 2010, and 2014.

Table (1): Sudan's under-five mortality rate for 1970, 1990, 2000, 2010, and 2014

Year	1970	1990	2000	2010	2014
under-five mortality rate/1000 live births	158	124	114	103	68

Source: UNICEF (2011) and MICS (2014).

Khartoum State has achieved the least percentage decline in under-five mortality in the time lapse between the two censuses years 1993 and 2008 .The question is what caused that? That is, what are the determinants of under-five mortality in Khartoum state in general, and are the determinants differ by mode of living (urban and rural).Child health is determined by many factors including parental education, access to health services, and income of families (S. B. Adebayo et al ,2005).

According to, child mortality is determined by a combination of socio-economic, biological, environmental, and behavioral factors (Mosley and Chen 1984).

2-Method

2.1 Study Design and Sampling

The study design is a cross-sectional community based one , according to the objectives and the structure of population this paper used the stratified three stage sampling and the sample size was 932 households residing in Khartoum state who have living mothers and was subjected to a birth experience **.**

2.2 Data

The study was based on the primary data collected from a sample of households in Khartoum State by using a specially designed questionnaire and through interview with mothers by trained field workers. Data were collected from the study area through a sample that was selected randomly from population under study. The data collected were analyzed by using logistic regression. The data analysis was done using SPSS 16.The dependent variable of this study is the existence of under-five categorized children as being dead (coded as 1) or alive (coded as 0). This paper divided the risk factors (determinants) of under-five mortality into four groups ,there are socio-economic and demographic characteristics (mode of living, place of origin, duration of living in Khartoum, level of education of father, occupation of father), maternal factors (age, level of education of mother, occupation of mother, age at the first childbearing, number of childbearing. , and mothers suffering from high blood pressure, diabetes, obesity, and other diseased), behavioral factors (medical checkup , number of medical checkups ,delivery under supervision of doctor and midwives , place of delivery (hospital , home , primary health center , other places) , average of breastfeeding , time of child's feeding , and expose of shisha , cigarette , snuff use (tombak) and alcohol), and personal illness control (reaction of mother when her baby is sick, immunization of mother against tetanus and number of doses she takes , immunizations of child below than 5 years of age against penta diseases (Polio, Tuberculosis, , Pneumococcal, Rota, Measles, and Meningitis).

2.3 Analysis

The analysis used binary logistic regression to build model for determinants of dying before age 5

2.4 Result:

1. Descriptive Analysis

Table (2) Association between the socioeconomic and demographic variables and under-five mortality:

1.**Residence**	Under five mortality		P.value
	Yes	No	
Rural	29 (11.9%)	91(13.2%)	.591
Urban	215(88.1%)	597(86.8%)	
2.Duration of living in Khartoum state			
Less than 6 years	41 (16.9%)	119(17.6%)	.008
6 – 20years	98(40.5%)	250(37%)	
21 – 35 years	47(19.4%)	197(29.2%)	
Highest thru 36 years	56(23.1%)	109(16.1%)	
3.Level of education of father			
Illiterate	51(21.2%)	54(6.9%)	.000
Basic/Primary	57(23.7%)	129(18.9%)	
Secondary	76(31.5%)	246(36.1%)	
University	51(21.2%)	234(34.3%)	
Postgraduate	6(2.5%)	19(2.8%)	
4.Occupation of father			.000
Labour	38(15.7%)	63(9.4%)	
Employee	53(22.2%)	244(36.3%)	
Self employed	145(60.7%)	358(53.2%)	
Other	3(1.3%)	8(1.2)	

It is observable from table (2) above that the mode of living is not significantly associated with under-five mortality. This due to the equality in providing health services and the similarity of economic conditions. Several studies shows the greatest relation between mode of living and under-five mortality (Kalaivani Mani et al, 2012), (Diddy Antai and Tahereh Moradi, 2010).

It seems obvious in the same table the significant relation between the duration of living in Khartoum state and under-five mortality, and this for Khartoum state characterized by high levels of health services compared to other states of Sudan.

The significant association between father education and under-five mortality is also clear, as Fathers education leads to higher use of the modern healthcare system. Second, father with higher education levels are more likely to take positive decisions on personal illness control. Table (2) shows that a significant relation between occupation of the father and the under-five mortality. This may be attributed to the fact that poverty tends to limit the access of the household to quality health care services, often leading to non-immunization of the child or treatment when child is sick.

Table (3) the association between maternal variables and under-five mortality

1.Age	Under five mortality		P.value
	Yes	No	
Less than 26 years	25 (10.2%)	154(22.5)	**.000**
26 – 34 years	85(34.8%)	297(43.5%)	
35 – 43 years	60(24.6%)	142(20.8%)	
More than 43	74(30.3%)	90(13.2%)	
2.Age at the first childbearing			**.000**
Less than 17 years	70 (28.8%)	91(13.4%)	
17 – 21 years	95(39.1%)	286(42.2%)	
22 – 26 years	51(21%)	209(30.9%)	
27- 32 years	21(8.6%)	70(10.3%)	
Highest thru 32	6(2.5%)	21(3.1%)	
3.Level of education of mother			**.000**
Illiterate	63(25.8%)	82(12%)	
Basic/Primary	69(28.3%)	148(21.6%)	
Secondary	57(23.4%)	231(33..8%)	
University	53(21.7%)	201(29.4%)	
Postgraduate	2(.8%)	22(2.3%)	

4.Occupation of mother			**000**
Housewife	185 (75.8%)	517(75.8%)	
Labour	14(5.7%)	25(3.6%)	
Employee	32(13.1%)	124(18.1%)	
Self employed	13(5.3%)	19(2.8%)	
5.Number of childbearing			**.000**
Less than 2	18 (7.4%)	116(16.9%)	
2- 3	111(45.5)	421(61.2%)	
4 – 5	74(30.3%)	110 (16%)	
More than 5	41(16.8%)	41(6%)	
6.Do you have			
Blood pressure	33(13.5%)	41(6%)	**.000**
Diabetes	47(19.3%)	54(7.8%)	**.000**
Obesities	22(9%)	52(7.6%)	.469
Others	26(10.7%)	30(4.4%)	**.000**

Table (3) shows that a significant association exists between the age of mother and under-five mortality. Mothers with high age are more likely experienced and aware of preterm birth, a birth of low weight and the death of neonatal in their first pregnancy. (Alio AP et al, 2012). Also this study figured out the association between age at the first childbearing and under-five mortality. A physiological immaturity of teenage mothers such as small uterus or narrow bony pelvis and lack of social experience on caring about newborn can lead to more neonatal deaths Wang CS et al, (2001)

It is observable in table (3) that a significant association exists between level of education of mother and the under-five mortality. The level of education can affect child survival by influencing her choices and increasing or limiting her skills in healthcare practices related to contraception, nutrition, hygiene, preventative care and disease treatment.

Table (3) also shows the relation between under-five mortality and occupation of mother, the occupation of mother has substantial effects through lack of proper feeding breastfeeding early in life, and however, a working mother can also be associated with high family income which can increase a child's survival.

It is clear in table (3) the significant relation between the under-five mortality and number of childbearing. The increase of numbers of childbearing means no adequate child spacing that lead to higher complications risk of obstetrics, and lead to increase the family size so the parental attention for their children decreases.

Finally table (3) shows that a significant association between diabetes and other disease in under-five mortality. The Infants of hypertension and

diabetes mother had a slightly higher gestational age and low birth weight, and neo-natal mortality. Sullivan SD et al, (2011)

Table (4) Association between the behavour variables and under 5 mortality:

1.During the pregnancy period did you have medical checkup	Under five mortality		
	Yes	No	**.000**
Yes	210(24.4%)	650(75.6%)	
No	34(47.2%)	38(52.8%)	
2.Number of medical check up			**.000**
Less than 3	111(45.5%)	208 (30.2%)	
3 – 5	67(27.5%)	196(28.5%)	
More than 5	66(27%)	284(41.3	
3.The delivery under the supervision of			
Doctor	152(62.3%)	524(76.2%)	**.000**
Midwife	105(43%)	190(27.6%)	**.000**
Others	0(0%)	1(.1%)	.551
4.Place of delivery			
Hospital	151(61.9%)	529(76.9%)	**.000**
Primary health center	18(7.4%)	54(7.8%)	.831
Home	90(36.9%)	133(19.3%)	**.000**
Other	0(0%)	2(.3%)	.399
5.Average of breastfeeding			**.000**
Less than 10	12(5.1%)	36(5.3%)	
10 – 14	32(13.6%)	62(9.2%)	
15 – 19	88(37.3%)	167(24.8%)	
More than 19	104(44.1%)	408(60.6%)	
6.Time of children's feeding			**.000**
Before they have reached 6 months	144(62.1%)	309(46.7%)	
After they have completed 6 months	88(37.9%)	352(53.3%)	
7.Smoking cigarette,and shisha and exposing tombak, alcohol			
Cigarette	2(.8%)	5(.7%)	.885
Shisha	0(0%)	2(.3%)	.399
Tombake	3(1.2%)	10(1.5%)	.798
Alcohol	3(1.2%)	9(1.3%)	.925

Table (4) shows the significant association that exists between the medical checkup and under-five mortality. The medical antenatal care services such as checkups and Tetanus Toxoid (TT) injection reduce neonatal mortalities. The regular medical checkup can treat potential pregnancy problem and mother received advices of nutrition and physical and physiological change.

Moreover the number of medical checkups has significant association with under-five mortality. Pregnancy problems and complications can range from mild to severe and it appears in different times during the

pregnancy period, and it is difficult for a woman to determine them so increase of numbers of medical checkup will treat pregnancy problems and complications.

Moreover this table shows the significant association between delivery under the supervision of doctor and midwives and under-five mortality. It is clear that delivery under the supervision of doctor and trained midwife leads to reducing the direct obstetric mortality.

The significant association between average of breastfeeding and under-five mortality. The breastfeeding is important for infants to survive, grow and develop properly. Breast milk is rich in nutrients, anti-bodies and contains the right quantities of fat, sugar, water and protein. The children with exclusive breast feeding are more likely have strong immune system. There is a significant association between time of children's feeding and under-five mortality. From around six months of age, babies need solid foods in addition to breast milk or formula for adequate nutrients and energy, also experiences of eating early in life can affect attitudes and habits later on, as well as influence health.

Finally it is revealed in table (4) the insignificant association between the women who are exposed to snuff use, smoking cigarette and shisha despite of their born babies who women who smoke cigarettes and shisha are more likely have less weight at birth and increase risk for respiratory diseases.

Table (5): Association between the personal illness control and under-five mortality:

1.Action of the mother when her child sick	Under five mortality		P.value
	Yes	No	
Use native treatment	75(30.7%)	141(20.5%)	**.000**
Go to the pharmacy	20(8.2%)	53(77%)	.805
Go to the doctor	198(81.1%)	616(89.5%)	**.001**
Go to neighboring	3(1.2%)	4(.8%)	.304
2.Do immunize yourself against tetanus (Yes)	183(23%)	613(77%)	**.000**
Number of doses			.252
Less than 2	96(42.7%)	259(40.4%)	
2 – 4	86(38.2%)	282(44%)	
highest thru 4	43(19.1%)	100(15.6%)	

3.Do you immunize your child less than 5 years			
Yes	209(88.9%)	644(96.7%)	**.000**
4.Immediately after childbearing do you immunize you babies after against			
Polio	172(78.7%)	595(86.5%)	**.004**
Tuberculoses	192(78.7)	588(85.5%)	**.003**
Immediately after the first 6 week do immunize your babies against			
Polio	194(79.5%)	625(90.8%)	**.000**
Penta	206(84.4%)	645(93.8%)	**.000**
Pneumococcal	181(74.2%)	610(88.7%)	**.000**
Rota	171(70.1%)	684(84.9%)	**.000**
Immediately after the first 2 month's do immunize your babies against			
Polio	192(78.9%)	627(91.1%)	**.000**
Penta	203(83.2%)	643(93.5%)	**.000**
Pneumococcal	174(71.3%)	607(88.2%)	**.000**
Rota	164(67.2%)	585(85%)	**.000**
Immediately after the first 3 month's do immunize your babies against			
Polio	191(78.3%)	617(89.7%)	**.000**
Penta	204(83.6%)	638(92.7%)	**.000**
Pneumococcal	173(70.9%)	605(87.9%)	**.000**
Rota	142(58.2%)	478(69.5%)	**.012**
Immediately after the first 9 month's do immunize your babies against			
Measles	201(82.4%)	639(92.9%)	**.000**
Meningitis	168(68.9%)	516(75%)	.141
Immediately after the first 18 month's do immunize your babies against			
Measles	169(69.3%)	561(81.5%)	**.000**
Polio	176(72.1%)	547(79.5%)	**.001**

The reaction of mother/family when her child is sick is very important factor to determine the under-five mortality especially in early moment. Table (5) shows the significant relation between the under-five mortality and the use of traditional treatment, and visiting the doctor when her child was sick. Going to doctor is the best way for sickness treatment and treatment of children, using the ideal native treatment is also best method of treatment

sometimes natives treatment is better than chemical medicine for children less than 5 years of age . Going direct to pharmacy to bring the medicine without any medical advices is a wrong way for sickness treatment and table (5) shows the insignificant association between going to pharmacy and neighbors with under-five mortality.

It is clear also the significant association between immunizing mother against tetanus and under-five mortality. The immunizations of mothers against tetanus protect mothers and their newborn infants from killer disease of tetanus.

Table (5) shows that there is insignificant association between the number of doses of tetanus and under-five mortality because there is no wide differences between the percentage of under-five mortality for less than two doses (42.7%) and the percentage of under-five mortality for two and above doses (57.3%) . WHO confirmed that tetanus vaccination produces protective antibody levels in more than 80% of recipients after two doses.(WHO,2005).

Increasing access to immunization in developing countries is a key reason for the decline in under-five mortality.This paper confirmed the relation between immunization of under-five children and under-five mortality and this relation is shown clearly in the above table .The immunization protects children against serious diseases (Polio, Penta, Pneumococcal, Rota, Measles, and Meningitis), and vaccines play a central role in ending preventable child deaths.

2. Build Model

To assess the determinants of under-five mortality in Khartoum state binary logistic regression is used ,and a dependent variable of dying before 5 years of age or not dying before 5 years. The following are the results obtained.

The P. values (.521) in the following table (6) means that it is not statistically significant and that leads to the fact that the model is quite a good and appropriate

.

Table (6) Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	7.143	8	.521

Table (7) variable in equation

	B	S.E	Wald	df	Sig.	Odd ratio	95.0% C.I for odd ratio	
							Lower	Upper
Mode of living	-.3	.4	1.0	1	.310	.743	.418	1.319
original home of the population of Khartoum state	.0	.02	.02	1	.892	1.003	.959	1.050
duration of living in Khartoum	-.01	.01	.8	1	.360	.993	.978	1.008
Age	**.04**	**.02**	**7.2**	**1**	**.007**	**1.045**	**1.012**	**1.079**
level of education of mother	-.06	.1	.2	1	.667	.947	.737	1.215
occupation of mother	.13	.1	1.3	1	.250	1.140	.912	1.427
level of education of father	-.2	.1	3.4	1	.066	.801	.632	1.015
occupation of father	.07	.1	.2	1	.634	1.067	.818	1.391
number of childbearing.	.1	.1	3.1	1	.080	1.131	.985	1.299
age at the first childbearing	**-.06**	**.03**	**5.1**	**1**	**.024**	**.941**	**.892**	**.992**
Medical checkup	.2	.4	.2	1	.648	1.225	.513	2.928
numbers of medical checkup	**-.09**	**.04**	**6**	**1**	**.014**	**.913**	**.849**	**.982**
delivery under supervision of doctor	-.06	.6	.01	1	.911	.938	.306	2.880
delivery under supervision of midwife	.06	.5	.01	1	.916	1.059	.365	3.070
place of delivery hospital	-.17	.6	.08	1	.785	.843	.248	2.867
place of delivery center	.023	.6	.0	1	.971	1.023	.298	3.516
place of delivery home	-.18	.6	.1	1	.763	.838	.265	2.646
Duration of pregnancy less than 32 weeks	**-1.1**	**.3**	**16.9**	**1**	**.000**	**.343**	**.206**	**.572**
Weight of birth less than 2kg	-.3	.3	1	1	.328	.750	.422	1.334
Average of breastfeeding	**-.1**	**.02**	**12.4**	**1**	**.000**	**.933**	**.898**	**.970**

time child's feeding	-.1	.2	.1	1	.703	.925	.619	1.382
Expose cigrate	20.3	16639.5	.0	1	.999	646088174.364	.000	.
Expose shisha	2.8	1.9	2.2	1	.142	16.420	.393	686.200
Expose alchol	.97	1	1.02	1	.312	2.633	.403	17.189
suffer from obesity	.232	.4	.4	1	.532	1.261	.610	2.609
suffer from blood pressure	-.475	.3	2.04	1	.153	.622	.324	1.193
suffer from diabetes	**-.599**	**.3**	**4.2**	**1**	**.040**	**.550**	**.310**	**.973**
Immunization of children less than 5 years	-.086	.5	.03	1	.862	.917	.348	2.420
Use native treatment	.099	.3	.14	1	.707	1.105	.657	1.856
Go to the pharmacy	.154	.4	.14	1	.709	1.166	.521	2.611
Go to the doctor	-.040	.4	.01	1	.911	.960	.474	1.946
Go to neighboring and bring their child drugs	.209	1.6	.02	1	.898	1.233	.050	30.503
immunization of mother against tetanus	.321	.4	.7	1	.409	1.378	.643	2.952
number of doses	.03	.1	.00	.217		1		.642
Constant	-43.6	33278.9	.00	.000		1		.999

The previous table (7) shows the variables age of mother, age at the first childbearing case, number of medical checkups, duration of pregnancy less than 32 weeks, Average of breastfeeding, and suffering from diabetes are all significant and remnant independent variables of study included in the table (7) are not significant.

Wald statistic states that the age of mother is risk factor (7.210 and the p.value .007) and the odd ratio of the age of mother indicates that the possibility of having under-five mortality increases with age of mother by 1.045 times.

According to Wald statistic and its P.values of age at the first childbearing (5.110, .024) respectively shows the significance of this variable and the odd ratio of age at the first childbearing indicates that the under-five mortality increases by .941 times with age at the first childbearing. The relation between age at the first childbearing and under-five mortality is negative.

There was also an inverse relation between numbers of medical checkups and under-five mortality, the Wald statistic and its P.values (5.994, .014) .the odd ratio shows that the under-five mortality increases by .913 times with number of medical checkups.

The duration of pregnancy less than 32 weeks is a risk factor of under-five mortality, the relation between them is negative, and the odd ratio of the pregnancy age less than 32 weeks shows the under-five mortality increased by .343 times. The highly significance of Average of breastfeeding (P.value =.000), also the relation between the under-five mortality and average of breastfeeding is negative; the odd ratio indicates that the under-five mortality increases by .933 times with average of breastfeeding.

Finally the relation between the suffering of mother from diabetes and the under-five mortality is negative and it is the odd ratio means the under-five mortality increases by .550 times with suffering of mother from diabetes.

3.Model building

To build model of under-five mortality from the main risk factors we reanalyze the main significant variables (age of mother , age at the first childbearing, numbers of medical checkups, duration of pregnancy less than 32 weeks, average of breastfeeding, and mother suffers from diabetes) by entering them in one model.

Table (8) Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	5.781	8	.672

The P. values in table (8) which is .672 confirmed the model a good fit.

Table (9) variable in equation

	B	S.E	Wald	df	Sig.	Odd ratio	95.0% C.I for odd ratio	
							Lower	Upper
Age	.055	.009	36.610	1	.000	1.056	1.038	1.075
Age at the first childbearing	-.068	.018	14.266	1	.000	.934	.902	.968
Numbers of medical checkup	-.105	.030	11.817	1	.001	.901	.848	.956
Pregnancy age less than 32 weeks	-1.041	.207	25.255	1	.000	.353	.235	.530
Average of breastfeeding	-.071	.017	18.143	1	.000	.931	.901	.962
Mother suffers from diabetes	-.682	.244	7.775	1	.005	.506	.313	.817
Constant	3.611	.844	18.317	1	.000	37.020		

Table (9) shows the main risk factors or determinants of under-five mortality from the target independent variables of study. The study found that there was a positive relation between age and the under-five mortality and negative relation between (age at the first childbearing, numbers of medical checkup, duration of pregnancy less than 32 weeks, average of breastfeeding, and suffering from diabetes) and the under 5 mortality.

The P.value of age <.05 that means age is a risk factor .This finding is consistent with the study by Majige Selemani et al, (2014).The mothers with high age are more likely to experience preterm birth, delivery of low birth weight infants and neonatal death in their first pregnancy. The odd ratio indicates the under-five mortality increases by 1.056 times with the age of mother and the true effect in population would be lieing between (1.038, 1.075).

Age at the first childbearing also has significant effect (P.value of age <.05), the study of Jocelyn elaborates. E Finlay et al ,2011) confirmed this result , The first-born children of adolescent mothers are the most vulnerable to infant mortality and poor child health outcomes and the risk of under 5 mortality increases by .934 times with age at the first childbearing .The true effect of this variable in the population would be between (.902 , .968).

Number of medical checkup has significant effect (P.value of age <.05) on the under-five mortality. This finding was found by Stephen Hodgins et al, (2016), it appears the mothers care during the pregnancy period has effect on the health of maternal and child health, and The increasing the

numbers of medical checkups will treat pregnancy symptoms and complications. This effect measures by .901 times and the accurate effect in the population would be between (.848, .956).

The duration of pregnancy less than 32 weeks has the lowest occurrence of risk factors. The effect of this variable measures by .353 times and the accurate occurrence in population would lies between (.235, .530). This finding is consistent with the study of Tanya Marchant,(2012) . Moderately preterm babies who are also small for gestational age experience considerably increased under-five mortality.

The average of breastfeeding has significant effect on the under-five mortality and this result is concluded by Mari Jeeva Sankar *et al*, (2015). The children with exclusive breast feeding are more likely have strong immune system as Breast milk is rich in nutrients and anti-bodies.(P.value of average of breastfeeding <.05).It increased the under 5 mortality by .931 time and the true effect of this variables in population can occur between (.901, .962)

Finally the suffer from diabetes increased the under-five mortality by .506 times and would be lies in the population between (.313, .817).also it appears the significance of this variable. These finding are reliable with Abdelmoneim E.M. Kheir *et al*, 2012

The model of the determinants illustrated in the following equation;

$$P=\frac{odd}{1+odd}=\frac{e^{3.611+.055\,X1-.068\,X2-.105\,X3-1.1041\,X4-.071X5-.682\,X6}}{1+e^{3.611+.055\,X1-.068\,X2-.105\,X3-1.041\,X4-.071\,X5-.682\,X6}}$$

Where:

X_1= age, X_2= age at the first Childbearing X_3= number of medical checkup X_4= duration of pregnancy X_5= average of breastfeeding X_6= mother suffer from diabetes.

Discussion

The higher neonatal mortality rate among infants born to teenage mothers in our study corresponds with previous studies (Markovitz BP et al, 2005).

The age of mother is important factor that has effect on under-five mortality, The mother with high age are more likely to experience preterm birth, delivery of low birth weight infants , and neonatal death in their first pregnancy.(Alio AP et al ,2012).

Age at the first childbearing like previous factor has greatest effect on the under–five mortality .Delaying the age at first childbirth may be a valuable strategy to promote and improve neonatal health. Usually adolescent mothers facing financial and social problems and that lead to poorness in child care (Markovitz BP et al, 2005). Also, physiological immaturity of teenage mothers such as small uterus or narrow bony

pelvis and lack of social experience on caring newborn can lead to more neonatal deaths (Wang CS et al, 2001).

Malachi Arunda (2017) confirmed that during the pregnancy period the medical checkup is important factor that has an effect on the health of maternal and child health, and most pregnant women hope to give birth safely to a baby that is alive and well and to see it grow up in good health. Antenatal Care services such as checkups and Tetanus Toxoid(TT) injection could effectively and significantly reduce neonatal mortalities. . Pregnancy symptoms and complications can range from mild to severe and it appears in different times during the pregnancy period and it is difficult for a woman to determine which symptoms are normal and which are not. The increase of numbers of medical checkup will treat pregnancy symptoms and complications.

Infants born preterm remain vulnerable to many complications, including respiratory distress syndrome, chronic lung disease, injury to the intestines, a compromised immune system .As such they are more likely than infants born full in term to die during the neonatal period (first 28 days) and infancy (first year), and mortality rates increase proportionally with decreasing gestational age or birth weight. (Alexander et al., 1999; Allen et al., 2000; Lemons et al., 2001; CDC, 2005i). Worldwide, nearly fifteen million infants (11%) are born preterm each year (Blencowe H et al, 2012). Preterm birth is the 3rd leading cause of Disability Adjusted Life Years (DALYs) across all age groups and is the leading cause of death in children under-five years of age, responsible for over 800,000 deaths per year (14% of total)(Institute for Health Metrics and Evaluation,2016). Preterm birth has a pivotal role in the mortality and morbidity among newborns.

For infants to survive, grow and develop properly they require the right proportion of nutrients. Breast milk is rich in nutrients, anti-bodies and contains the right quantities of fats, sugar, water and protein. The children with exclusive breast feeding are more likely to have strength of immune system. Breastfeeding is undoubtedly the "gold standard" food source in the first months of postnatal life. The World Health Organization and the American Academy of Pediatrics recommend at least six months of exclusive breastfeeding, which is defined by breast milk as the only source of sustenance (Figueiredo B et al, 2014). After the first six months breastfeeding has a critical source of nutrition, and Raju TN (2011) confirmed the true effect of breastfeeding on the under-five mortality

The infants of maternal diabetes had a slightly higher gestational age and low birth weight. Shannon D et al (2011)

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