

Chapter Four

DATA COLLECTION AND ANALYSIS

4.1: Introduction

Chapter four deals with measuring instrument such as questionnaire and the random sample which designed for collecting the data of relevance, and the analysis of these data leading to relevant results with their appropriate discussion and main findings which drawn from.

4.2: Design of Data Collection Tools

Since no adequate secondary data were found, the collection of primary data is inevitable. The tools that used for this purpose are:

4.2.1: The Questionnaire

To provide primary data for use in achieving the pre-stated research objectives, a questionnaire is designed which consists of five sections each one devoted for partial theme as follows:

1. Socioeconomic and Demographic Characteristics

The Mode of living, the population of Khartoum state, duration of living in Khartoum, level of father 'education, and the father'' occupation.

2. Maternal Variables

Mother' age, the level of mother' education, mother' occupation, the first childbearing age, the number of childbearing. , and mothers suffer from blood pressure, diabetes, obese, and other diseases.

3. Behavior Variables

Medical checkup, the number of medical checkup ,delivery under supervision of doctor and midwives , place of delivery (hospital , home , primary health center , other places) , average of breastfeeding , time child's feeding , and abuse of shisha , cigarette ,Snuff (tobacco) and alcohol.

4. Personal Illness Control Variables

The conduct of mother since her baby is sick. Immunization of mother against tetanus and the number of doses, the immunizations of child less than 5 years against Polio, Tuberculosis, Pentad, Pneumococcal, Rota, Measles, and Meningitis.

5. Under-Five Mortality Variables

The under-five mortality, the number of the under-five mortality, the type of under-five mortality, cause of death. The questionnaire contains of others variables like duration of pregnancy less than 32 weeks and the birth weight less than 2 kg.

The designed questionnaire was pretested for reliability, validity consistency, and fine-tuning prior to its use in collecting data. A copy of its final version is annexed (1).

4.2.2: The Sample

The target population is the households that living in Khartoum state. The sample units for each household with housewife and subjected to a birth experiences. The selection of administrative areas used PPS (Cochran, 1977), and the selection of the households that used systematic random methods.

The sample is based on the structure of the population and research objectives that mentioned in chapter one, the appropriate sample design is stratified three stages sampling. The overall samples size in this case is obtainable by using the following formula:

$$n = \frac{z^2 pq}{d^2} \text{deff} \times \text{nonresponse rate}$$

Where

n: sample size

Z: the 95% confidence coefficient (1.96)

p: proportion of under-five mortality in Khartoum state = .105 (*Sudan population census, 2008*)

q: $1-p = 0.895$

d: allowable margin of error = .03

deff: design effect for stratified multi-stage sampling = 2

nonresponse rate=1.2

Accordingly, the sample size is (964).

The CBS sample frames used to distribute the sample size and select the administrative units. The households of Khartoum state are stratified according to the mode of living into two strata (rural and urban), and sample size allocated proportionally into (rural and urban) (Walter A. *et al*, 2012) as shown in the table below (4.1).

Table (4.1) Allocation of a sample size by mode of living

Mode of living	Number of Households	Number of administrative units	Number of Clusters
Rural	43433	3	4
Urban	448665	8	33
Total	492098	11	37

Source: Sudan Population Census, 2008

The sample size of each type (rural and urban) divided proportionally into selected administrative units, and the share of administrative units divided into 30 to find the total number of the clusters (residential areas) that will be used for this research. The P.P.S used to select the administrative units and residential areas, and systematic random sample that used to select the households.

4.2.3: Field Work

A pre-test has been conducted in ministry of health Khartoum state for the designed questionnaire. The data collected by trained volunteers

of Khartoum health localities. The daily review of the questionnaire was carried out by the data collectors and the researcher. The main problem that faced the data collectors is the division of selected administrative areas into small sectors to facilitate representation and data collection.

Residential areas together with the selected administrative units are annexed.

4.3: The Analysis

It is worth mentioning that due to well-designed questionnaire and close field supervision of field work, the response rate was 84 %. which is by all standards which are judged to be fairly high.

4.3.1: Socioeconomic and Demographic Characteristics of Respondents

Table (4.2) below summarizes some of the socioeconomic and demographic characteristics of the study population which drawn from sample data.

1. Population of Khartoum state

For the existence of livelihoods, health, education and other services the most population of Khartoum state come from different states of Sudan. Table (4.2) shows the most of the study population is the original Khartoum people (29.8%), also it is clear that the most immigrants to Khartoum state came from Gazira state (10.2%) and Northern state (8.9%).

2. The Level of father' education

The level of education is the most important factors for all aspects of life, the most frequent level of education of the father among the study population is the secondary level (34.9%) and the second level is the university level (30.9%).

3. The father' Occupation

The child born in the less educated family and in a difficult condition, prenatally within the first month of life is leading of dying childbearing. The most of father' occupation is self- employed (54%) and (31.9%) were employee.

4. The duration of living in Khartoum state

The duration of residence in Khartoum state may be one of the determinants of under-five mortality, the mean of the duration of living in Khartoum state (21.4 years) ,standard deviation (14.6 years) ,minimum values (one year) , maximum values (70 years) . Calculation of the 95% confidence interval (CI) by using the following formula

$$\bar{x} \pm Z \left(\frac{S.D}{\sqrt{n}} \right)$$

So that 95 % CI of the mean of the duration of living in Khartoum state between 20.4 – 22.3 years. The study is used the mean and standard deviation to construct the variables into groups and it found the most frequent duration of living in Khartoum state is 6 - 20 years (37.9%), and 21-35 years (26.6%).

Table (4.2) Socioeconomic and demographic characteristics:

1.Population of Khartoum state by state of origin	%
Northern State	8.9
Nhar Nile state	4.6
Kassala	2.0
Red Sea	1.8
Algadaref	2.3
Sinar	3.8
Khartoum	29.8
Gazira	10.2
White Nile	6.4
Blue Nile	3.0
Northern Kordofan	6.2
Western Kordofan	4.0
Southern Kordofan	3.8
Northern Darfur	3.4
Western Darfur	.9

Eastern Darfur	1.7
Southern Darfur	5.2
West Darfur	.4
Others	1.6
2. Level of education of father	
Illiterate	11.4
Basic/Primary	20.2
Secondary	34.9
University	30.9
Postgraduate	2.7
3. Occupation of father	
Labour	10.8
Employee	31.9
Self- employed	54.0
Others	1.2
4. Duration of living in Khartoum state in (years)	
less than 6	17.4
6 - 20	37.9
21 – 35	26.6
More than 35 years	18.0

Sources: Own data

4.3.2: The Association between Socioeconomic and Demographic Characteristics and Under-five Mortality

The following table (4.3) shows the association between socioeconomic and demographic characteristics such as residence, duration of living in Khartoum state, level of education of father, and occupation of father and under-five mortality.

Table (4.3) Association between the socioeconomic and demographic variables and under 5 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. Father' education			
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. Father' occupation			
Labour	38(15.7%)	63(9.4%)	.000
Employee	53(22.2%)	244(36.3%)	
Self- employed	145(60.7%)	358(53.2%)	
Other	3(1.3%)	8(1.2)	

Sources: Own data

1. Residence

It is observed that table (4.3) above presents the mode of living is not significantly associated with under-five mortality. So the equality is in providing health services and the similarity of economic conditions.

The several studies show the greatest relation between mode of living and under-five mortality (Kalaivani Mani et al, 2012), (Diddy Antai and Tahereh Moradi, 2010). Table (4.3) shows the Existence of mortality (11.9%) and absences of mortality (No) (13.2%) in rural areas, this also applies to urban areas (Yes) (88.1%) for mortality, and (No) (86.8%) for absences of mortality.

2. Duration of living in Khartoum state

It seems obviously that in the same table the significant relation between the duration of living in Khartoum state and under-five mortality. Khartoum state characterized by high levels of socioeconomic and health services compared with other states of Sudan. when the duration of living in Khartoum state has increased the under-five mortality was decreased. Stay less than 6 years (16.9%), (6-20) years (40.5%), (21 -35) years (19.4%), stay highest through 36 (23.1%).

3. Father' education

The significant association between father' education and under-five mortality is also clear. Fathers" education leads to higher use of the modern healthcare system. So the fathers with higher education levels are more likely to take positive decisions on personal illness control. Illiterate (21.2%), primary/ basic (23.7%), secondary (31.5%), and university (21.2%).

4. Father' Occupation

Table (4.3) shows that a significant relation between occupation of the father and the under-five mortality. This may be attributed to the fact that poverty leads 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 (4.3) shows when the level of occupation has increased the mortality of under-five mortality was decreased, labor (15.7%), employee (22.2%), self- employed (60.7%).

4.3.3 :Maternal variables

The studying of the under-five mortality is inevitable for studying the maternal variables. The substantial of the maternal variables that shows in Table (4.4) are (age, level of education, occupation, age at the first childbearing, and number of childbearing).

Table (4.4): Maternal variables:

1.Age	Frequency	%
less than 26	179	19.3
26 – 34	382	41.2
35 – 43	202	21.8
More than 43	164	17.7
3. Mother' education		
Not educated	145	15.6
Basic/Primary	217	23.4
Secondary	288	31.0
University	254	27.4
Postgraduate	24	2.6
4. Mother' occupation		
Housewife	702	75.6
Labour	39	4.2
Employee	156	16.8
Self- employed	32	3.4
5. The Age at the first childbearing		
Less than 17	161	17.5
17 – 21	381	41.4
22 – 26	260	28.3
27 – 32	91	9.9
More than 32	27	2.9

5.Number of childbearing		
Less than 2	134	14.4
2 – 3	532	57.1
4 – 5	184	19.7
More than 5 births	82	8.8

Sources: Own data

1. Age

Firstly the age of mother is important factor that has impacted on under-five mortality, to describe this variable. Firstly the study calculated mean (34.8 years) Standard deviation (9.5 years), minimum value (15 years) maximum value (70 years), and calculated the 95% CI of mean that between 34.2 – 35.4 years. Secondly the study divided age of mother into classes according the mean and Standard deviation and it found the frequent class is 26 – 34 years 41.2 % and the lowest class is less than 26 years 19.3%.

2. Mother' education

The level of education of mother can affect the under-five mortality, the relationship between mother's education and under-five mortality has received a lot of attention. The number of studies have been conducted on this relationship like (Aristide Romaic Bado et la, 2016) and table (5.3) shows 31% are secondary 27.4% are university and 23.4% are basic/primary.

3. Mother' occupation

The occupation level as same as is of the level of education. The occupation is important determinants for the under-five mortality. Work during pregnancy increases premature birth and neo-natal mortality (Margaret, 2006) also the poverty is risk for under –five mortality. The study found most of mothers are housewife (75.6%), the mothers who are employee (16.8%)

4. The age of the first childbearing

The first step in description of the variable is calculated mean (22.1 years), Standard deviation (5 years), minimum value (13 years), and maximum value (50 years). The estimation is the 95% CI of mean between 21.7 – 22.4 years. The study used mean and Standard deviation to divide this variable into five groups, these groups show that the most mothers of Khartoum state have first childbearing between 17 – 21 years (41.4%) and second majority between 22 – 26 years (28.3%), and 17.5 % have first childbearing at the range less than 17 years, as the result these groups showed the importance of the variables in study under-five mortality.

4. The Number of childbearing

The numbers of childbearing's not only have an effect on fertility, but also on maternal and child health. The study calculated mean (4) births, and SD (2) births, minimum value (1) birth, and maximum value (10) births. 95% CI of is mean between (3- 4) births. The groups of the number of childbearing's used the mean and SD, these groups show the most of mothers have childbearing between (2 – 3)births (57.1%) and lowest range are mothers who have childbearing more than 5 births (8.8%).

4.3.4: The Association between Maternal Variables and Under-five mortality

The study shows determinants of under-five mortality is inevitable for studying the maternal mortality because it could be highly associated .Table (4.5) shows the association between the maternal variables and the under 5 mortality.

Table (4.5) 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%)	
5. The 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%)	
6. Mother' education			.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%)	
7. Mother' Occupation			000
Housewife	185 (75.8%)	517(75.8%)	
Labor	14(5.7%)	25(3.6%)	
Employee	32(13.1%)	124(18.1%)	
Self –employed	13(5.3%)	19(2.8%)	

8. The 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

Sources: Own data

1. Age of mother

Table (4.5) shows a significant association exists between the age of mother and under-five mortality. Mothers above 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). When the age of mother has increased the under-five mortality increased less than 26 (10.2%), 26 – 34 years (34.8%), 35 – 43 years (24.6%), and more than 43 years (30.3%).

2. The age of the first childbearing

The 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), the under-five mortality of less than 17 years is (28.8%), 17-21years is (39.1%), 22 -26years is (21%), 27 – 31 years is (8.6%), and more than 31 years (2.5%).

3. Mother' education

It is observed that in table (4.5) the significant association exists between level of education of mother and the under-five mortality, so the

level of education can affect child survival by influencing her choices and increasing or limiting her skills in healthcare practices which related to contraception, nutrition, hygiene, preventative care and disease treatment. The table (4.5) shows the high level of education when increased that the under-five mortality is decreased; illiterate (25.8%) basic/primary (28.3%), secondary (23.4%) university (21.7%), and the postgraduate (.8%).

4. Mother' occupation

Table (4.5) shows the relation between under-five mortality and occupation of mother. The occupation of mother inevitable has affected the lack of proper feeding breastfeeding early in life, however, a working mother can also be associated with high family income which can increase a child's survival. The table (4.5) shows the under-five mortality of housewife (75.8%), and Self- employed (5.3%).

5.The number of childbearing

It is clear to say that in table (4.5) the significant relation between the under-five mortality and number of childbearing. The increase of numbers of childbearing means no adequate child spacing age that lead to higher complications risk of obstetrics, and lead to increase the family size so the parental attention for their children decreases .The increase of childbearing leads to increase the family size so the parental attention for their children decreases less than 2 (7.4%), 2- 3 (45.5%), 4 -5 (30.3%), highest through 6 (16.8%).the number of childbearing was determinant of under 5 mortality.

6. Mother' disease

Finally, table (4.5) shows that a significant association between diabetes and other diseases 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)

4.3.5: Behavior Variables

There are several studies have shown the importance of behavioral mothers variables like (medical checkup and number of medical checkup, average of breastfeeding, time feeding children, and smoking cigarettes ,shisha , and abuse tobacco and alcohol) in the interpretation of under 5 mortality. Table (4.6) shows the behavior variables.

Table(4.6)Behavior variables:

1.During the pregnancy period did you have medical checkup	Frequency	%
Yes	860	92.3
No	72	7.7
2.Number of medical checkups		
Less than 3	251	29.2
3 – 5	261	30.3
More than 5	348	40.5
3.Place of delivery		
Hospital	680	73
Primary health center	72	7.7
Home	223	23.9
Others	2	.2
4.Average of breastfeeding		
Less than 10	48	5.3
10 – 14	94	10.3
15 – 19	255	28.1
More than 19	512	56.3
4. The Time of children’s feeding		

Before they have reached 6 month's	453	48.6
After they have completed 6 month's	440	47.2
6.Smoking cigarettes ,and shisha ,tobacco, and alcohol		
Cigarettes	7	.8
Shisha	2	.2
Tobacco	13	1.4
Alcohol	12	1.3

Sources: Own data

1. Medical checkups

The medical checkup is more important factor that has an effect on the health of maternal and child health during the pregnancy period, The most pregnant women hope that her baby during birth be safely and alive and well in order to see it grow up in good health. The study found 92.3% during medical checkup.

2. The Number of medical checkups

Antenatal care (ANC) is a globally recommended strategy which used to prevent neonatal deaths, and WHO determined specific number of prenatal care (at least 4) during pregnancy period. The study calculated the mean of prenatal care "visit which is (5.5) times, Standard deviation (2.8) times, minimum value (1) time maximum value (9) times, and the estimation of the 95% CI of mean between 5.3 – 5.7 times.

3. The Place of delivery

The previous studies (Justice Ajaari , 2012) (Gurmesa Tura, ,2013) confirmed that the place of birth is effective factor of under 5 mortality. The study shows that 73% deliver their babies in the hospital and 23.9 % deliver their babies at home, and 7.7% deliver at primary health center.

4. The Average of breastfeeding

The study found that the most important factor that has an effect under 5 mortality so the mean (20.2 months), standard deviation (4.6months), minimum

value (1 month) maximum value (32 months) of the average of breastfeeding. The estimation of 95% CI of mean of the average of breast feeding between 19.9 – 20.5 months the study used the mean and Standard deviation to divided the average of breastfeeding into four groups less than 10 months (5.3%), 10- 14 months (10.3%), 15 – 19 months (28.1%), and more than 19 months (56.3%) that mean most mothers of Khartoum state have period of breastfeeding more than 19 months.

5. Smoking Cigarettes, and Shisha, and exposing tobacco, and alcohol

The study found that mothers who have abused cigarettes are (.8%), shisha are (.2%), were tobacco (1.4%), and alcohol is (1.3%).

4.3.6: The Association Between The Behavior Variables and Under-five Mortality

The behavior variables like (checkup during pregnancy period, number of checkup ,delivery under supervision of doctor and midwives , place of delivery , average of breastfeeding , time of child feeding ,and consumption of cigarettes, shisha , tobacco ,and alcohol) have highly significance association with under 5 mortality that reflected in the previous studies .

1. Medical Checkups

Table (4.6) shows the significant association that exists between the medical checkups 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. The result appears in the percentage of 75.6% of the mothers have medical checkup have no under-five mortality.

2. The number of medical checkups

The number of medical checkups has significant association with under-five mortality. Moreover, 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. The under-five mortality of less than 3 is (45.5%) , 3-5 is (27.5%), and more than 5 is (27%).

3. The delivery under the supervision of doctor and midwives

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

4. Place of delivery

The P .value of delivery in hospital and home was $<.05$ and the delivery in primary health center and other $> .05$ that mean there is relation between the delivery in hospital and home and under 5 mortality. The delivery in the hospital and home could be under supervision of doctors and trained midwives. In addition to that there is no relation between the delivery in primary health centers and other places (farms).

5. The average of breastfeeding

Table (4.7) shows 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. Therefore, the increase of the average of breastfeeding less to increase the percentage life chances of under 5 ,less 10 month 5.3% ,10-14 months 9.2% ,15 – 19 months (24.8%) ,and more than 19 months (60.6%).

6. The time of children's feeding

There is a significant association between time of children's feeding and under-five mortality under six months of age, babies need

nutritional food 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, and this appears when feeding children before they have reached 6 months (62,1%) than feeding children after they have reached 6 months (46.7%). The time of feeding children is determined of the less than 5 mortality.

7. Smoking cigarettes and shisha, and exposing tobacco, alcohol

The P.value of smoking cigarettes, and shisha, and exposing tobacco , and alcohol were $> .05$ this reveals almost there were no relation between above variables and under-five mortality also those variables could not be determinants for under-five mortality. This against to babies born to women who smoking cigarette and shisha are more likely have less weight at birth and increase risk for respiratory diseases.

Table (4.7) Association between the behaviour variables and under 5 mortality:

1.During the pregnancy period did you have medical checkup	Under five mortality		P.value
	Yes	No	
Yes	210(24.4%)	650(75.6%)	.000
No	34(47.2%)	38(52.8%)	
2.Number of medical check up			
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 tobacco, alcohol			
Cigarette	2(.8%)	5(.7%)	.885
Shisha	0(0%)	2(.3%)	.399
Tobacco	3(1.2%)	10(1.5%)	.798
Alcohol	3(1.2%)	9(1.3%)	.925

Sources: Own data

4.3.7: Personal Illness Control

The developed and developing countries care about the preventive methods through health education program to prevent their children's from the varieties diseases.

1. The reactions of mother if one of her children is sick

The following table (4.8) shows that most of the mothers who visit the doctor (87.3%) when their children sick, (23.2%) have used herbal treatment, and (.8%) were went to their neighbors to bring their child medicine.

2. Immunization of the mothers against tetanus

The immunization of the mothers against the tetanus is preventing mothers and her babies during the pregnancy period. The WHO recommended five doses during or before pregnancy period. Table (4.8) shows that (86.5%) of mothers of Khartoum state have immunized against tetanus and (17.5%) have doses highest thru 4 , most of mothers has taken dose range to (2 – 3) (45.4%), and (34.4%) less than two doses

3. Immunization of the children less 5 years

The immunization of children less than 5 years protects children from several infections and disability diseases like polio, meningitis, measles, and tuberculosis. The study found (94.7%) from the mothers of Khartoum state immunized their under-five children.

4. Immunization of babies immediately after birth against Polio and Tuberculosis

The study found the babies of Khartoum state immediately after birth were immunized against polio and tuberculosis by (92.4%) and (91.7) respectively.

5. Immunization of babies immediately after 6 weeks from the birth against Polio, Penta , Pneumococcal and Rota

The study found the babies of Khartoum state immediately after 6 weeks from their birth were immunized against Polio and Penta, Pneumococcal and Rota (92%) ,(94.8%) , (90.7%),and (86.4%) respectively.

6. Immunization of babies immediately after 2monthes from the birth against Polio, Penta , Pneumococcal and Rota

Table (4.8) shows that the babies of Khartoum state immediately after 2 months from their birth were immunized against Polio and Penta, Pneumococcal and Rota (92%) ,(94.5%) , (89.9%),and (86.2%) respectively.

7. Immunization of babies immediately after three months from the birth against Polio, Penta , Pneumococcal and Rota

Tables (4.8) shows that the babies of Khartoum state immediately after 3 months from their birth were immunized against Polio and Penta, Pneumococcal and Rota (90.8%) ,(94.1%) , (89.6%),and (73%) respectively.

8. Immunization of babies immediately after six months from the birth against Measles and Meningitis

It is appear in table (4.8) immediately after the six months from the birth the mothers immunized their babies against measles and meningitis (94.1%) and (80.2%) respectively.

9. Immunization of babies immediately after eighteen months from the birth against Measles and Polio

Table (4.8) shows that the immediately after 18 months from their birth mothers immunized Measles and Polio (86.2%) and (84.5%) respectably.

Table (4.8) Personal illness control variables:

1.The action of the mother if one her children was sick	Frequency	%
Use herbal treatment	216	23.2
Go to the pharmacy	73	7.8
Go to the doctor	814	87.3
Go to neighboring and bring their children drugs	7	.8
2.Do immunize yourself against tetanus		
Yes	796	86.5

No	124	13.5
Number of dose		
Less than 2	274	34.4
2 – 3	361	45.4
highest thru 4	142	17.8
3.Do you immunize your child less than 5 years		
Yes	853	94.7
No	48	5.3
4.Immediately after childbearing do you immunize you babies after against		
Polio	734	92.4
Tuberculosis	730	91.7
5.Immediately after the first 6 week do immunize your babies against		
Polio	732	92
Penta	755	94.8
Pneumococcal	722	90.7
Rota	688	86.4
6.Immediately after the first 2 month's do immunize your babies against		
Polio	732	92
Penta	752	94.5
Pneumococcal	716	89.9
Rota	686	86.2
7.Immediately after the first 3 month's do immunize your babies against		
Polio	723	90.8
Penta	749	94.1
Pneumococcal	713	89.6
Rota	581	73
8.Immediately after the first 6 month's do immunize your babies against	Frequency	%

Measles	749	94.1
Meningitis	643	80.2
9.Immediately after the first eighteen months do you immunize your babies against		
Measles	686	86,2
Polio	673	84.5

Sources :own data

4.3.8 The Association between Personal Illness Control and Under-five mortality

The personal illness control variables like (the action of mother when her child is sick and maternal and child immunization against dying. Disability disease) are very important to determine not only the under –five mortality but also the health of children and their mothers at the same time.

Table (4.9) the association between the personal illness control and under5 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
Tuberculosis	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

Sources :own data

1. Reaction of mother when her child is sick

The reaction of mother/family when her child is sick is very important factor that leads to determine the under-five mortality especially in early

moment. Table (4.9) 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 (4.9) shows the insignificant association between going to pharmacy and neighbors with under-five mortality.

2. Immunization of mothers against tetanus

It is clear to say that significant association between immunizing mother against tetanus and under-five mortality. The immunizations of mothers against tetanus protect mothers and their newborn infants from leading to death . This relation appears in percentage of mother who has immunized against the tetanus and have no under 5 mortality (77%) immunization of mothers against tetanus was determinants of under5 mortality.

3. The number dose of tetanus immunization

Table (4.9) 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).

3. Immunization of under-five children

Increasing access to immunization in developing countries is a key reason for the decline in under-five mortality.This study 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, and Measles), and vaccines play a central role in ending preventable child deaths.

Table (4.10) under-five mortality and its causes

Children who died before reaching age five	Frequency	%
Yes	244	26.2
No	688	73.8
Cause of death		
Malaria	26	10.7
Diarrhoea	70	28.7
Pneumonia	46	18.7
Others	133	54.5
Number of households that have under-five mortality	244	
Average of under-five mortality	1.3	
Standard deviation	.6	
Minimum	1	
Maximum	5	

Sources: own data

The aim of this study is to find the percentage and risk factors of under – five mortality in Khartoum state , the study found the percentage of the under-five mortality (26.2%) , and the average number of death (1.3) death by differences (.6) death among households which is very high that appears in minimum value (1) death and maximum value (5) deaths . This study used multi-choices question to find leading causes of death. The majority leading causes of

death in Khartoum is diarrhea (28.7%) and pneumonia (18.7%) is second leading causes of under-five mortality. Globally, pneumonia, diarrhea and malaria remain among the leading causes of death among children under-five mortality accounting for almost a third of global under-five deaths. The leading causes of death among children under-five mortality in 2018 included preterm birth complications (18 %), pneumonia (15 %), intrapartum-related events (13 %), congenital abnormalities (9 %), diarrhea (8 %), neonatal sepsis (7 %) and malaria (5%)(UNICEF,2018).

4.4: Determinants of Under-five Mortality

The researcher used logistic regression and the main purpose of this is to find the risk factors (determinants) of under-five mortality and calculate the odd ratio. The predictor variables are included in the model are Mode of living, original home of the population of Khartoum state, duration of living in Khartoum, level of father "education, father "occupation, age, the level of mother" education / mother" occupation, age at the first childbearing, the number of childbearing. , and mothers suffer from blood pressure, diabetes, obese, and other diseases, Medical checkup , number of medical checkup ,delivery under supervision of doctor and midwives , place of delivery (hospital , home , primary health center , other places) , average of breastfeeding , time child's feeding , and expose of shisha , cigarette , tobacco , alcohol, Action of mother when her baby is sick, immunization of mother against tetanus and number of doses, immunizations of child less than 5 years against (Polio, Tuberculosis, Penta, Pneumococcal, Rota, Measles, and Meningitis) in the first stage . The second stage is the study od finding the main determinants or risk factors and built model from the significances predictor variables in the first model and calculate the odd ratios for these predictor variables.

Table 4.11 Classification Table step0

	Observed	Predicted		
		Under 5 mortality		Percentage Correct
		No	Yes	
Step 0	Under 5 mortality	579	0	100.0
	Yes	195	0	.0
	Overall Percentage			74.8

Sources :own data

Table (4.11) shows that the under-five mortality would be correct by 74.8%.

Table (4.12) below illustrates the variables in the equation, which is the constant term at the moment. It can be realized that the intercept-only model has in (odds) = -1.088. If the researcher exponent both sides of this expression he find that our predicted odds [Exp (B)] = .337. That is, the predicted odds of having under-five mortality are .337. Since 195 of the sampled have under-five mortality and 579 did not have. Wald statistic is computed and since it is 172.771, the null hypothesis is rejected that indicate the constant made a significant contribution to the model.

Table 4.12 Variables in the Equation

	B	S.E.	Wald	Df	Sig.	Exp(B)
Constant	-1.088	.083	172.771	1	.000	.337

Source :own data

Table (4.13) Hosmer and Lemeshow Test

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

Source :own data

Table (4.13) illustrates Hosmer-Lemeshow (H-L) test. The statistic under consideration has a significance of .521 which means that it is not statistically significant and that leading to the fact the model is quite a good fit.

Table(4.14) variable in equation

	B	S.E	Wald	df	Sig.	Odd ratio	95.0% C.I for odd ratio	
							Lower	Upper
Mode of living	-.3	.293	1.03	1	.310	.74	.418	1.319
original home of the population of Khartoum state	.0	.023	.02	1	.892	1.003	.959	1.050
duration of living in Khartoum	-.01	.008	.84	1	.360	.99	.978	1.008
Age	.04	.016	7.21	1	.007	1.05	1.012	1.079

Level of mother" education	-.06	.127	.16	1	.667	.95	.737	1.215
Mother "occupation	.13	.114	1.32	1	.250	1.14	.912	1.427
level of education of father	-.2	.121	3.37	1	.066	.80	.632	1.015
occupation of father	.07	.136	.23	1	.634	1.07	.818	1.391
Number of childbearing.	.1	.071	3.06	1	.080	1.13	.985	1.299
age at the first childbearing	-.06	.027	5.11	1	.024	.94	.892	.992
Medical checkups	.2	.445	.21	1	.648	1.23	.513	2.928
numbers of medical checkups	-.09	.037	5.99	1	.014	.91	.849	.982
delivery under supervision of doctor	-.06	.572	.01	1	.911	.938	.306	2.880
delivery under supervision of midwife	.06	.543	.01	1	.916	1.06	.365	3.070
place of delivery hospital	-.17	.624	.08	1	.785	.84	.248	2.867

place of delivery center	.02	.630	.001	1	.971	1.02	.298	3.516
place of delivery home	-.18	.587	.09	1	.763	.84	.265	2.646
pregnancy age less than 32 weeks	-1.1	.260	16.88	1	.000	.34	.206	.572
Weight of birth less than 2kg	-.3	.294	.957	1	.328	.75	.422	1.334
Average of breastfeeding	-.1	.020	12.381	1	.000	.93	.898	.970
time child's feeding	-.1	.205	.145	1	.703	.94	.619	1.382
Expose cigarette	20.3	16639.5	.000	1	.999	646088174.36	.000	.
Expose shisha	2.8	1.904	2.159	1	.142	16.42	.393	686.200
Expose alcohol	.97	.957	1.022	1	.312	2.63	.403	17.189
Mother suffering from obesity	.23	.371	.391	1	.532	1.26	.610	2.609
Mother suffering from blood pressure	-.48	.332	2.044	1	.153	.62	.324	1.193
Mother	-.60	.291	4.217	1	.040	.55	.310	.973

suffering from diabetes								
Immunization of children less than 5 years	-.09	.495	.030	1	.862	.92	.348	2.420
Use native treatment	.10	.265	.141	1	.707	1.11	.657	1.856
Go to the pharmacy	.15	.411	.139	1	.709	1.17	.521	2.611
Go to the doctor	-.04	.360	.013	1	.911	.96	.474	1.946
Go to neighboring and bring their child drugs	.21	1.637	.016	1	.898	1.23	.050	30.503
immunization of mother against tetanus	.32	.389	.681	1	.409	1.38	.643	2.952
number of doses	.03	.072		.22		1		.642
Constant	-43.6	33279		.00		1		.999

Sources: own data

The previous table (4.14) shows the variables age of mother, age at the first childbearing, numbers of medical checkup, pregnancy age less than 32 weeks, Average of breastfeeding, and mother suffering from diabetes are all significant and remnant independent variables are all 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 increased 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 variables and the odd ratio of age at the first childbearing indicates that the under-five mortality increased by .941 time with age at the first childbearing. There was an inverse relation between age at the first childbearing and under-five mortality. Also there was negative relation between numbers of medical checkups and under-five mortality .The odd ratio shows that the under-five mortality increased by .913 time with number of medical checkups.

The age of pregnancy which less than 32 weeks is risk factor of under 5 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 time. The highly significance of Average of breastfeeding (P.value =.000), also the relation between the under 5 mortality and average of breastfeeding is negative, the odd ratio indicates that the under-five mortality increased by .933 time with average of breastfeeding.

Finally the relation between the mother suffering from diabetes and the under-five mortality is negative and it is appear from the odd ratio that the under-five mortality increased by .550 time for the mother suffering from diabetes.

4.4.1: Main Determinants

To find the main determinants the researcher analyze the main significant variables (Age of mother, Age at the first childbearing, Numbers of medical checkup, Pregnancy age less than 32 weeks, Average of breastfeeding, and mother suffers from diabetes) by enter them in one model.

Table (4.15) classifications table

Observed	Predicted		
	Under 5 mortality		Percentage Correct
	No	Yes	
Under 5 mortality	662	0	100.0
Overall Percentage	235	0	.0
			73.8

Source :own data

Table (4.15) shows that if the researcher knew nothing about the variables that including in the model and the guessing of under-five mortality would be correct 73.8%.

Table (4.16) Hosmer and Lemeshow Test

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

Source :own data

The significance of Hosmer and Lemeshow which is .672 shows that the model a good fit.

Table (4.17) variables in equation

	B	S.E	Wald	D f	Sig.	Odd ratio	95.0% C.I for odd ratio	
							Lower	Upper
Age	.06	.01	36.61	1	.000	1.06	1.04	1.08
Age at the first childbearing	-.07	.02	14.27	1	.000	.93	.90	.97
Numbers of medical checkups	-.11	.03	11.82	1	.001	.90	.85	.96
Pregnancy age less than 32 weeks	-1.04	.21	25.26	1	.000	.35	.24	.53
Average of breastfeeding	-.07	.02	18.14	1	.000	.93	.90	.96
Mother suffering from diabetes	-.68	.24	7.78	1	.005	.51	.313	.82
Constant	3.61	.84	18.32	1	.000	37.02		

Sources: own data

Table (4.17) shows the main risk factors or determinants of under-five mortality from the target independent variables of study. The study found there was positive relation between age and the under-five mortality and negative relation between (age at the first childbearing, numbers of medical checkups, pregnancy age less than 32 weeks, average of breastfeeding, and suffer from diabetes) and the under-five mortality.

The P.value of age $<.05$ that mean age is risk factor these finding are consistent with the study by Majige Selemani et al, 2014, and the mother with high age are more likely experienced preterm birth, delivery of low birth weight infants and neonatal death in their first pregnancy the

mothers the odd ratio indicates the under-five mortality increases by 1.056 times with the age of mother and the true effect in population can be lies between (1.038 , 1.075).

The first age of childbearing has significant effect (P.value of age <.05),the study of Jocelyn 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 time with Age at the first childbearing .the true effect of this factors in the population can be occurs between (.902 , .968).

The numbers of medical checkups have significant effect (P.value of age <.05) on the under 5 mortality. This finding was found Stephen Hodgins et al, 2016, the mothers care during the pregnancy period has effect on the health of maternal and child health, and The increasing the numbers of medical checkup will treat pregnancy symptoms and complications . This effect measure by .901 time and the accurate effect in the population can be lies between (.848, .956).

The pregnancy age less than 32 weeks has lowest occurrence of risk factors measures by .353 and true occurrence in the between (.235, .530) population but it is significant. The finding of the study of the Tanya Merchant, in 2012, is consistent with this result. Moderately preterm babies who are also small for gestational age experience a considerably increased the under 5 mortality.

The average of breastfeeding has significant effect on the under-five mortality and this result concluded by Mari Jeeva Sankar *et al* ,2015. The children with exclusive breastfed are more likely have strength immune system that for Breast milk is rich in nutrients and antibodies.(P.value of age <.05).It increased the under-five mortality by .931

time and the true effect of this variables in population can be occur between (.901, .962)

The mother suffering from diabetes increased those under-five mortality by .506 time and can be occur in the population between (.313, .817). Also it appears the significant 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;

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

Where:

X1= age, X2= age at the first Childbearing X3= number of medical checkup X4= duration of pregnancy X5= average of breastfeeding X6= mother suffer from diabetes.

4.5: Under-five Mortality Indicators

The following tables (4.18) shows the KMO and Bartlett's Test that appears the adequacy of sampling (.664) ,and the data is suitable for using factor analysis (P.value .000).

Table (4.18) KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.664
Bartlett's Test of Approx. Chi-Square Sphericity	8.469E3
Df	666
Sig.	.000

Table (4.19) Communalities

	Initial	Extraction
Residence	1.000	.669
Duration of living at Khartoum state	1.000	.597
Age of mother	1.000	.767
Level of education of mother	1.000	.689
Occupation of mother	1.000	.577
Level of education of father	1.000	.593
Occupation of father	1.000	.464
Number of childbearing	1.000	.682
Age at the first childbearing	1.000	.592
Medical checkup	1.000	.599
Number of medical checkup	1.000	.586
Delivery under supervision of doctor	1.000	.876
Delivery under supervision of midwives	1.000	.879
Delivery under supervision of other	1.000	.503
Delivery at hospital	1.000	.885
Delivery at primary health centers	1.000	.821
Delivery at home	1.000	.856
Delivery at other	1.000	.639
Pregnancy age less than 32 weeks	1.000	.652
Weight of babies at birth less than 2kg	1.000	.704
Time of feeding children	1.000	.481
Mother expose cigarette	1.000	.682
Mother expose tobacco	1.000	.639

Mother expose alcohol	1.000	.667
Mother suffer from obesity	1.000	.525
Mother suffer from blood pressure	1.000	.549
Mother suffer from diabetes	1.000	.604
Mother suffer from other disease	1.000	.600
Immunization of children less than 5 years	1.000	.546
Mother uses native treatment	1.000	.600
Mother goes to pharmacy	1.000	.647
Mother goes to doctor	1.000	.655
Mother goes to neighboring to bring their child medicine	1.000	.498
Mother uses others	1.000	.665
Immunization of mother against tetanus.	1.000	.679
Number of tetanus dose	1.000	.702
Average of Breastfeeding	1.000	.466

Extraction Method: Principal Component Analysis.

The above table clarifies that the factors extracted explain a significant proportion of the variance of the derived variables .from the table it found the most important variable has contribution in construction factors was delivery at hospital (88.5%)the delivery under the supervision of midwives (87.9%), the delivery under the supervisor of doctors (87.6%) , the delivery at home(85.6%) , the delivery at the primary health centers (82.1%) , the age of mother (76.7%) , delivery child his weight less than 2kg (70.4%) ,the number of medical checkup(70.2%) , also there were variables have fair contribution like expose of cigarette , immunization of the mother against the tetanus ,residence , expose

alcohol , the mother has taken his child to the doctor when he is sick , the age pregnancy less than 32 weeks which respectively (68.2% ,67.9% , 66.9% , 66.7% , 65.5% ,and 65.2 %)

The following table shows the eigenvalues (the component variation) of correlation matrix, the second part relate to the extraction of the sum of square loading, and the third part relate to rotation sum of square loading. The study used the eigenvalues greater than one and it gives, the first variables equal 5.361 and it explains 14.49% of variation structures. It found the variables from 1 to 13 were the greatest explanation variables of the variation structure among the determination variables of under-five mortality and each one has eigenvalues greater than one (14.49, 6.393% , 5.547% , 4.555% , 4.206% ,3.92% ,3.716% ,3.565%, 3.326% , 3.177% ,3.002% ,2.879% ,2.879%, 2.854%,2.79%). The table shows also the 14 indicators explained the 64.414% from the total variation of the variable after rotation which respectively from 1 to 14 explained (10.182%, 6.17%, 5.711% ,5.313%, 4.706% , 4.28% , 4.113% , 4.07% , 3.79% , 3.409% , 3.256% , 3.208%, 3.167%, 3.039%)

(4.20)Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.36	14.49	14.49	5.36	14.49	14.49	3.77	10.18	10.18
2	2.37	6.39	20.88	2.37	6.39	20.88	2.28	6.17	16.35
3	2.05	5.55	26.43	2.05	5.55	26.43	2.11	5.71	22.06
4	1.69	4.56	30.99	1.69	4.56	30.99	1.97	5.31	27.38

5	1.56	4.21	35.19	1.56	4.21	35.19	1.74	4.71	32.08
6	1.45	3.92	39.12	1.45	3.92	39.12	1.58	4.28	36.36
7	1.38	3.72	42.83	1.38	3.72	42.83	1.52	4.11	40.48
8	1.32	3.57	46.40	1.32	3.57	46.40	1.51	4.07	44.55
9	1.23	3.33	49.72	1.23	3.33	49.72	1.40	3.79	48.34
10	1.18	3.18	52.90	1.18	3.18	52.90	1.26	3.41	51.74
11	1.11	3.00	55.90	1.11	3.00	55.90	1.21	3.26	55.00
12	1.07	2.88	58.78	1.07	2.88	58.78	1.19	3.21	58.21
13	1.06	2.85	61.64	1.06	2.85	61.64	1.17	3.17	61.38
14	1.03	2.78	64.41	1.03	2.78	64.41	1.13	3.04	64.41
15	.94	2.54	66.95						
16	.92	2.48	69.44						
17	.88	2.38	71.82						
18	.86	2.32	74.13						
19	.84	2.26	76.39						
20	.79	2.13	78.52						
21	.77	2.07	80.59						
22	.72	1.94	82.52						
23	.70	1.89	84.41						
24	.65	1.74	86.16						
25	.62	1.69	87.84						
26	.61	1.64	89.48						
27	.57	1.54	91.02						

28	.54	1.46	92.48					
29	.53	1.44	93.92					
30	.49	1.31	95.23					
31	.46	1.26	96.49					
32	.34	.93	97.41					
33	.33	.89	98.30					
34	.26	.70	99.00					
35	.21	.56	99.56					
36	.12	.33	99.89					
37	.04	.11	100.00					

Source: own data

Table (4.21) :Rotated Component Matrix

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Residence			-.412											
Duration of living at Khartoum state			.715											
Age of mother			.757											
Level of mother "education .mother "occupation		.717												
Level of father "education father "occupation		.530												
Number of childbearing											.330			
Age at the first childbearing		.677												

Medical checkup				.603						
Number of medical checkup				-						
				.737-						
Delivery under supervision of doctor				-						
				.909-						
Delivery under supervision of midwives				.903						
Delivery under supervision of other				.				.670		
Delivery at hospital				-.868						
Delivery at primary health centers								-		
								.863-		
Delivery at home				.847						
Delivery at others									-	
									.737-	

Pregnancy age less than 32 weeks					.791	.			
Weight of babies at birth less than 2kg					.819				
Time of feeding children			.493						
Mother expose cigarette							.805		
Mother expose tobacco							.774		
Mother expose alcohol					.798				
Mother suffer from obesity									
Mother suffer from blood pressure							.581		
Mother suffer from diabetes									-.661
Mother suffer from other disease									.637

Immunization of children less than 5 years				.495								
Mother uses native treatment					.479							
Mother goes to pharmacy					.747							
Mother goes to doctor					-.735							
Mother goes to neighboring to bring their child medicine											.630	
Mother uses others												
Immunization of mother against tetanus.				-.661								
Number of tetanus dose				.781								
Average of Breastfeeding				.						.336		

Source: own data

