# Factors Related to Deaths of Under 5 Years Old Children in Dar Alsalam Area-Khartoum-Sudan


## Abstract

**Objectives**: This study is done to identify factors affecting under five mortality in Dar Alsalam area, Khartoum.

**Material and Method**: A community based cross-sectional study was carried out in Dar Alsalam, Khartoum during March- April 2012, square 25. A total of 240 women in reproductive age who had an experience of child death were interviewed. The data was collected by semi-final medical students using structured questionnaire. Two stage cluster sampling was used to select the households.

## Data Analysis

Data was summarized using descriptive statistics and logistic regression analysis was carried out to identify factors associated with under-five mortality.

## Results

Age of 156 (65%) of the deceased children was less than one year, while the age of 84 (35%) was between one and five years. The age of (25%) of the mother at the time of their child birth was below 18 years. The majority of the mothers (70.8%) were illiterate, 74.2% were working and 80% were married. Of the children 51.7 were males and for 74.2% of them the birth interval was less than 2 years. Only 16.7% were breast fed for more than two years while the rest (83.3%) were breast fed up to 2years. Only 34.2% of the deceased children had completed their vaccination, and 68.3% had been admitted to hospital more than once before death.

Half of the families have piped water in their houses, 75.8% of the houses there are pit latrines and 68.3% there is electricity supply.

Logistic regression analysis identified incomplete vaccination, not employed mothers and having no latrines in the house as the factors related to the death of children between 1-5 years than those below one year.

## Conclusion

Under-five mortality in low socioeconomic areas is associated with Low family income, mother's illiteracy, early marriage and absence of latrines in the houses. Keywords



**Key Words**: Factors, Under Five Mortality, Dar Alsalam, Khartoum.


## 1. Introduction

Under-5 mortality (U5M) is often used as an indicator of population health and performance of the health system of the country [(1)]. U5M rate declined from 1.2% per year between 1990 and 1995, to 3.9% per year between 2005 and 2012 [(2)]. In spite of this substantial drop in global child

mortality rate, about 6.6 million children still die every year before their fifth birthday worldwide which implies 18,000 under-five children die each day [2]. U5M includes deaths that occur between birth and age five [3].

Under-5 mortality is unacceptably high in many developing countries, the burden of which is mainly borne by the poor [4] . About 41% of child deaths occur in sub-Saharan Africa [5]. Most of the neonatal mortalities are due to low birth weight and preterm labour and child mortalities are due to simple preventable diseases such as diahorrea, malaria, acute respiratory infection and malnutrition [6].

Factors influence child health and survival includes maternal, child and house related factors. Studies has shown association between mother age at birth, education, occupation and child survival [7,8].Each year, adolescent girls worldwide give birth to 13 million infants[9], and infant born to teenage mothers are known to be at particularly higher risk of dying [10]. A study carried out in Pakistan showed that children born to older women 30-39 years were exposed to significantly higher neonatal and post natal mortality [11].

Higher female literacy rates were strongly and significantly associated with lower U5M [4]. Mother education affects her skills in health care practices related to hygiene, nutrition, contraception, preventative care and disease treatment [12]. A strong associations had been reported with maternal employment outside the home which significantly increases the odds of U5M rate in a study carried out considering socioeconomic differences in neonatal, postnatal and child mortality in 28 countries [13]. A study done in rural Northern Ghana showed that married women were less likely to experience child death than single parents [14].

Child related factors that affect child mortality include birth interval, breastfeeding, vaccination and admission to hospital. Health related behaviors, such as birth spacing is important risk factors for child mortality [15]. There is high mortality rate when there is short birth interval [16]. A study carried out in Pakistan showed that breastfeeding has numerous bio-demographic, social, and economic effects and it affects the health and nutritional status of both, the mother and child [11]. A study done in India showed that breastfeeding had reduced child mortality by 70% [17]. Infants aged 0–5 months who are not breastfed have seven-fold and five-fold increased risks of death from diarrhea and pneumonia, respectively, compared with infants who are exclusively

breastfed.(18) At the same age, non-exclusive rather than exclusive breastfeeding results in more than two-fold increased risks of dying from diarrhea or pneumonia [18]. Immunization is important factor that affects U5M. A study done in Malakal Town, Southern Sudan showed significant association between immunization and child mortality [19].

Environmental conditions have long been considered to have a significant influence on child mortality. Such conditions include access to sanitation, source of drinking water, source of energy and type of dwelling [12]. Studies conducted have shown strong association between access to clean water, sanitation and clean source of energy with infant and child mortality [20]. The effects of these factors are so interlinked that they should be assessed together rather than individually. Child mortality rates, more than doubled where the source of drinking water was other than piped water and where poor sanitation existed child mortality rates are higher [12].

Sudan is classified as having made insufficient progress to achieve MDG-4 [21]. The infant mortality rate is 60 per 1,000 live births and the under-five mortality rate is 82 deaths per 1,000 live births and. the neonatal mortality rate is also high ranging from 34 to 47 per 1,000 births [22]. Dar Alsalam is a settlement established in 1991 to accommodate the displaced that migrated to Khartoum mainly from North Kurdofan as a result of the 1985 famine [23].The settlement is located to the west of Omdurman, one of the three towns that constitute Khartoum the capital of Sudan. Population who live in these settlement neither enjoy the same health care services as similar infrastructure as other formal urban areas, nor having proper environmental and housing conditions. This is why this study is carried to identify factors related to U5M in this settlement.

## 2. POPULATION AND METHODS

### 2.1 Study Design

This is a descriptive community-based cross sectional study.

### 2.2 Study Area

The study was carried out in DarAlsalam area, west Omdurman, Khartoum locality. Dar alsalam area is 32000 square meters and consisted of 53 blocks with a population size of 11,000. The study area was block number 25 which was randomly selected. It consists of 2000 household.

## 2.3 Study Population

Mothers in reproductive age 15-49 years, resident of block number 25 in Dar Alsalam area. The included study mothers were those with past history of at least one dead under five (U5) child during her residency in Dar Alsalam and within the last five years.

## 2.4 Sampling and Sample Size

### 2.4.1 Sample Size

Sample size was calculated according to the following equation:

$$n = \frac{Z^2 pq}{d^2} * de$$

Where;

n = the desired sample size

Z= standard normal deviate=1.96

P = the prevalence of occurrence of U5 Child deaths, 80 per 1000 live births according to Sudan Household Survey(SHHS) in 2006 [24].

q = (1- p) = 1-0.080=0.92

d = the desired margin of error = 0.05

de= the design effect for two stage cluster sample = 2

Therefore; n =226 mothers

To avoid the replacement in case of missing data, the sample size was increased by 6% to give a total of 240 mothers.

### 2.4.2 Sampling Technique

It was two stage cluster sampling. First stage: one block was selected randomly from the 53 blocks in Dar Alsalam area; block number 25. Second stage: the households within block number 25 were selected by systematic random sampling at interval of 8$^{th}$ household. The first household was randomly selected from the center of the block and thereafter every 8$^{th}$

household was visited. In cases of absence or refusal to participate, neighboring house was chosen.

### 2.5 Tools and data Collectors

Data collection tool was structured close ended questionnaire targeted the interview of mothers having the dead child. The questionnaire was composed of four parts. The first part composed of the characteristics of mothers having U5 dead child that included current age of the mother, age of the mother at time of birth, education, occupation and marital status of the mother. The second part composed of the dead child characteristics that included child age at time of death, sex, birth interval from the previous child, history of breastfeeding, history of vaccination, and admission to hospital before death. The third part contained the information about family income and household characteristics included presence of electricity, latrines, and piped water.

The data collectors were fifth year medical students as part of complementary research project in community medicine training curriculum during academic year 2012.

For the purpose of this study the following definitions [(2)] was considered:

1. Infant mortality is defined as the death of a live born infant between birth and exact age one.

2. Under-5 mortality includes deaths that occur between birth and exact age five.

3. Birth interval, is defined as the length of time between two successive live births,

### 2.6 Data management and analysis

Data were cleaned and managed by the software SPSS version 20. Descriptive statistics were presented. Logistic Regression was carried out to identify factors associated with under-five mortality. Twelve factors were included in logistic regression model pre analysis; three maternal factors, five factors related to dead child, three housing factors and family income. Confidence level of 95% was selected to reflect the significance effect of the factors.

Ethical clearance was obtained from the ethical committee of Faculty of Medicine, University of Khartoum. Permission was taken from the administrative unit of block 25 in Dar Alsalam area

before the start of the study. An informed consent was signed by the selected mothers before the interview that reflected the confidentiality of the information

## 3. Results

Age distribution of deceased children revealed that(156) 65% were in the infancy period and (84) 35% were in the age group 1-5 years [ Fig 1]. Characteristics of mothers with deceased children had shown: Mothers at the age between 18-35 years when they delivered the deceased child accounted to (160) 66.7% and (60) 25% were at the age below 18 years. One hundred and seventy (70.8%) of the mothers were illiterate and 178 (74.2%) were having different working status including freelance. [Table 1]

Gender characteristics of the deceased children had shown (124) 51.7% males and (116) 48.3%females [Table 2].Mothers had less than two years birth interval between the deceased children and the previous one accounted to (178) 74.2% [ Table 2]. Two hundred children (83.3%) were breastfed up to 2 years, 158 (65.8%) did not complete their vaccination and (164) 68.3%of these children were admitted to hospital more than once before death [Table 2]. Half of houses 120 (50%) of deceased children had access to piped water, 182 (75.8%) had inside pit latrines and 164 (68.3%) had electricity. One hundred fifty eight (65.8%) Of the families were having family income range between 50-150 SDG per week [ Table 3].

Regarding factors associated with deaths of under-five children; twelve factors were included in logistic regression model as independent factors and the dependent variable was the distribution of age of deceased child into less than one year and 1-5 years. The factors were maternal age at child birth, education, occupation, five factors related to deceased child [Table 2] and three housing factors, and family income [Table 3]. The model yielded three factors related to the death of child between 1-5 years only. The factors are; incomplete vaccination of the child has

eleven times the chance to death [Table 4]. Children of mothers without any working status have four times the chance to death [Table 4].Children in houses without latrines have 3.5 times the chance to death[Table 4].

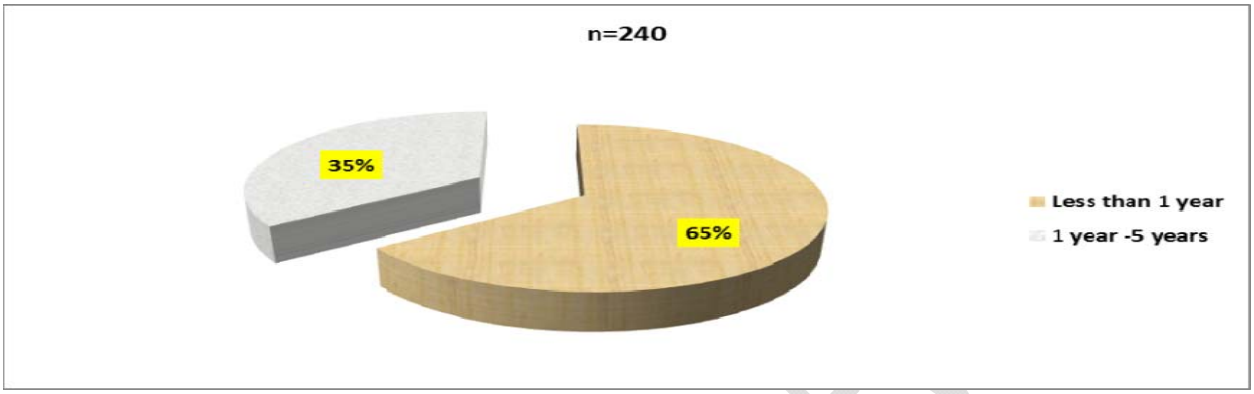


**Fig 1: Age of child at death in Dar Alsalam, Khartoum Sudan , 2012**

**Table1: Characteristics of mother with dead child in Dar Alsalam, Khartoum Sudan , 2012**

| | | Frequency | Percent |
|---|---|---|---|
| Current age of the mothers | 18-35 years | 78 | 32.5 |
| | more than 35 years | 162 | 67.5 |
| Age of the mothers when they delivered the deceased child | Less than 18 Years | 60 | 25 |
| | 18 - 35 Years | 160 | 66.7 |
| | More than 35 | 20 | 8.3 |
| Education | Illiterate | 170 | 70.8 |
| | Literate | 70 | 29.2 |
| Occupation | Working | 178 | 74.2 |
| | Not working | 62 | 25.8 |
| Marital status | Married | 192 | 80.0 |
| | Single | 48 | 20.0 |

**Table2: Characteristics of dead child in Dar Alsalam, Khartoum Sudan , 2012**

| **Characteristics of dead children (n=240)** | | **Frequency** | **Percent** |
|---|---|---|---|
| Gender | Male | 124 | 51.7 |
| | Female | 116 | 48.3 |
| Birth interval from the previous child | Less than 2 years | 178 | 74.2 |
| | More than 2 years | 62 | 25.8 |
| History of breastfeeding | More than 2 years | 40 | 16.7 |
| | Up to 2 years | 200 | 83.3 |
| History of vaccination | Complete | 82 | 34.2 |
| | Incomplete | 158 | 65.8 |
| Admission to hospital before death | Not admitted at all | 76 | 31.7 |
| | More than once | 164 | 68.3 |

**Table3: Characteristics of the house of dead child in Dar Alsalam, Khartoum, Sudan , 2012**

| Characteristics of the house of dead child (n=240) | | Frequency | Percent |
|---|---|---|---|
| Presence of piped water | Yes | 120 | 50 |
| | No | 120 | 50 |
| Presence of latrines | Yes | 182 | 75.8 |
| | No | 58 | 24.2 |
| Presence of electricity | Yes | 164 | 68.3 |
| | No | 76 | 31.7 |
| Family Income | Less than 50 SDG per week | 26 | 10.8 |
| | 50 - 150 SDG per week | 158 | 65.8 |
| | More than 150 SDG per | 56 | 23.4 |

**Table4:Factors associated with death of 1-5 years child in Dar Alsalam, Khartoum Sudan , 2012**

| Age of child at death (1-5 years) | Significance* | Odd Ration | 95% C.I. | |
|---|---|---|---|---|
| | | | Lower | Upper |
| Incomplete vaccination of the deceased child | 0.001 | 11.120 | 3.531 | 35.014 |
| Non occupation of the mother of the deceased child | 0.036 | 3.914 | 1.091 | 14.041 |
| Absence of latrines in the house of the deceased child | 0.038 | 3.549 | 1.073 | 11.734 |

*** Logistic regression**

## 4. Discussion

The age of the mother at the time of delivery of the child is a known predictor of U5M [25]. In this study 60 (25%) of the mothers at the time of delivery of the child were below 18 years of age. The result of the SHHS2006 showed that 36% of women in Sudan were married before the age of 18[24]. A study done in Northern Gana showed that infants born to teenage mothers are at higher risk of dying [14]. A study done in Austria showed that higher mortality risk for infants of younger mothers may be related to socioeconomic factors as well as biologic immaturity [26]. A study carried in England reported increased stillbirth and perinatal death in adolescent pregnancy, beside low birth weight and preterm which reported to cause neonatal death [27].Two third of the mothers' age in this study was 18-35 years when they gave delivery to their deceased children. This finding is different from Infant Mortality Statistics from the 2004 Period where the lowest rate of infant mortality is for mothers in their twenties and early thirties [28]. The increase of U5M in our study can be attributed to the socioeconomic status, nutritional health, quality of prenatal care, and lifestyle of the mother, rather than to age alone [29].

The majority of the study population was illiterate. Infant mortality rates are known to decrease with increasing educational levels [30]. The reasons may be that educated mothers are more likely to receive antenatal care and more capable of gaining access to health care [14]. Women with more education tend to have higher income levels, and they have better opportunities for the selection of the appropriate health care [10].

The majority of the women included in this study were working. In this sector of the town where the study was carried out women work as house servants or daily laborers with low wages. Mothers work can increase the family income which could positively affect the child survival [30]. However, working outside the home, may affect negatively child survival by preventing the mother from providing feeding and good care for the child [13]. Logistic regression analysis showed that the child between 1-5 years whose mother not working is approximately has four times the chance to die than those below one year. After the first year mothers usually start weaning their children and introducing food. Under low socioeconomic and poor environmental conditions children are more likely to suffer from diahorrial diseases and other infections.

One hundred and fifty six 156 (65%) of the children died before their first birth day. Children in sub-Saharan Africa have the highest risk of death in the first month of life [31]. Infant mortality is due to poor maternal health, inadequate care during pregnancy, inappropriate management of complications during pregnancy and delivery, poor hygiene during delivery and the first critical hours after birth, and lack of newborn care [32]. Causes of infant death after first year of life can be caused by infectious diseases, such as pneumonia, tetanus, and malaria [33].

One hundred and seventy eight (74.25%) of the deceased children in this study had a birth interval of less than two years. A study done in Malakal, South Sudan showed that there is a

225 significant association between birth interval and infant and U5M [19]. A study done in Pakistan
226 showed that birth interval is linked to prenatal care and child mortality. The same study showed
227 that babies born to mothers with shorter previous birth intervals who received prenatal care are
228 significantly more likely to have better survival chances during neonatal period than babies born
229 to mothers with the same short interval who did not receive prenatal care for the index child [11].

230 All women included in this study breast fed their children for two years. Breastfeeding has been
231 recognized as a significant factor in ensuring child survival [34]. Breast feeding provides babies
232 with both the nourishment and the antibodies to fight infectious diseases. Infants aged 0–5
233 months who are not breastfed have seven-fold and five-fold increased risks of death from
234 diarrhoea and pneumonia, respectively, compared with infants who are exclusively breastfed [35] .
235 At the same age, non-exclusive rather than exclusive breastfeeding results in more than two-fold
236 increased risks of dying from diarrhoea or pneumonia [36].Six to Eleven-month-old infants who
237 are not breastfed have an increased risk of deaths [37]. More than two third the deceased children
238 (68.3%) were admitted to hospital more than once before death. This could be explained by the
239 poor environmental and housing conditions which cause diseases like malaria, diarrhea and acute
240 respiratory illness. Rutstein 2002 showed that increase in the percentage of children receiving
241 medical attention for diarrhea, acute respiratory illness and fever was associated with decline in
242 U5M [8].

243 According to SHHS2006 only 56% of the population has access to clean water, and only 31% of
244 the population uses appropriate sanitation facilities [24]. In this study, logistic regression showed
245 children whose age (1-5) years living in houses having no latrine have 3.5 times a chance to die
246 than those below one year of age. Unhygienic and unsafe environments place children at risk of
247 death. Ingestion of unsafe water, inadequate availability of water for hygiene, and lack of access

to sanitation are known factors that contribute to the around 88% of deaths from diarrhea [38, 39]. Child mortality rates, more than doubled where the source of drinking water was other than piped water [20]. Where poor sanitation existed child mortality rates are higher. A study in Pakistan showed that families living in households with piped water connected in their houses have a significantly lower post neonatal mortality than those families which depend on wells for drinking water [11].

In this study most of the population's weekly income range from 50-150 Sudanese pounds which equals to 200-600 Sudanese pounds per month that is equivalent 16.7-50 dollars. A study carried out to determine income below the poverty line and wage structure in the Sudan showed that the household income at the poverty line for the Sudan for the year 2006 is equal to SD 52335 which equivalent to 2005, $US 227.5. Relating the estimated poverty line to the wage structure in the public sector in the Sudan, the majority of the Sudanese people working in the public sector were below the poverty line [40].

## 5. Conclusion

U5M in low income countries is due to mothers' illiteracy, short birth interval, incomplete child vaccination, low family income and poor housing conditions. Public health interventions, improving living conditions and raising mother awareness towards family planning and U5M causes are needed.

## Competing Interests

Authors have declared that no competing interests exist.

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