# FACTORS ASSOCIATED WITH HEALTH OUTCOMES IN DIARRHOEAL DISEASES AMONG CHILDREN AGED 2-59 MONTHSADMITTED TO COAST GENERAL HOSPITAL, MOMBASA COUNTY

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## Abstract

*Purpose:* Diarrhoea is among the leading causes of death among infants who are under five years despite it being preventable and treatable. However, nearly half a million children still die every year as a result of the disease.

*Methods:* A descriptive cross-sectional design hospital design was implemented in the study. This study was conducted in Coast General Hospital which is located in Mvita sub-County, Mombasa. A systematic sampling technique was used in the selection of patients who were admitted at the ward and Fischer's formula (1991) was used in the calculation of the sample size. The collection of data was achieved through the use of a structured interview schedule. The bivariate relationship that were associated with the health outcomes and other factors were assessed through the Spearman's rank-order correlation.

*Results:* The findings revealed that age, weight, low respiratory rate, capillary refill and children who required oxygen as the child related factors associated with health outcomes of diarrhoea. Marital status of the caregiver was the caregiver related outcome that was associated with health outcomes of diarrhoea and no health facility related factors were found to be significant.

**Conclusion:** Caregivers play a critical role in ensuring adequate healthcare of the children as such more efforts should be directed towards ensuring that they are knowledgeable diarrhoea management

*Keywords*: Acute Watery Diarrhoea, Chronic Diarrhoea, Diarrhoea, Dysentery, Shock.

## 1.0 INTRODUCTION

Globally, diarrhoea still remains as one of the leading causes of death among infants who are aged five years and below. Diarrhoea is characterised by the passage of watery or liquid stool two or more times within 24 hours (1). According to Dairo et al., some of the major risk factors associated with mortality due to diarrhoea include the child's age, poor nutritional status, poor breastfeeding practices and the caregiver characteristics (2). It can last for a number of days in turn resulting severe dehydration and fluid loss which are the two main causes of death (3). Diarrhoea kills at least 525,000 children who are under five around the world every year despite it being preventable and treatable. Additionally, there are at least 1.7 billion cases of diarrhoeal diseases worldwide(1). According to UNICEF, diarrhoea accounts for at least 8% of all deaths under five year in the world which translates to a total of 1300 children dying in a day (4).
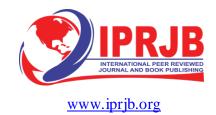
According to the World Health Organization, the management of diarrhoea among children under five should firstly involve proper feeding practices, an increase intake of fluids and supplemental zinc which is provided for at least 10 days in order for the prevention of dehydration (5). It is also critical that children with non-severe dehydration be given oral rehydration therapy while children with bloody diarrhoea or are suspected to have cholera should be given antimicrobials (1).

In the population of 525,000 infants who die as a result of diarrhoeal disease at least three-quarters of these cases are from Africa and Asia. This is largely attributed to the fact that this regions face health related issues in relation to sanitation and the access to clean and safe drinking water which are associated with the causation of diarrhoea(6). Additionally, poor hygiene practices during food preparation and feeding are common causes of diarrhoea among children in Africa (7).In Africa, one of the most common causes of hospitalization and deaths due to diarrhoea among children under five is rotavirus (8).This is largely attributed to caregiver factors like the age of the mother, the socio-economic status, occupation, marital status, and religion (9).

Another study also noted poor home management strategies of diarrhoea and poor hygiene practices as some of the major causes of mortality in Africa (7). It is also critical to note that at least 80% of all under five infant deaths that are associated with diarrhoea occur during the first two years of life and nearly a third of all under five infant deaths are attributed to diarrhoea (10). Diarrhoea is the second leading cause of death of under five children in Kenya with a prevalence level of 17%(5). A study conducted in Western Kenya revealed that the level of knowledge in relation to the management of diarrhoea is still low and a critical attribute to the prevalence of the disease in the area (11). Another study also noted that the mothers health behaviour and area of residence are the major causes of diarrhoea in the country (12).

## 2.0 MATERIALS AND METHODS

A descriptive cross-sectional design hospital design was implemented in the study as it is easy and convenient to apply as few resources are required to implement the design. This study was conducted in Coast General Hospital which is located in Mvita sub-County, Mombasa. It is a county referral hospital that attends to at least 98 children in a month. This study mainly focused

on infants who were aged 2-59 months who were admitted in the paediatrics isolation ward and information was mainly acquired from their caregivers. A systematic sampling technique was used in the selection of patients who were admitted at the ward which involved the selection of every 2nd infant who was admitted in the ward by referring to the inpatient admission register over a duration of 9 weeks. Additionally, all deaths that occurred during the study were also captured. Fischer's formula (1991) was used in the calculation of the sample size that was used in the study which was a total of 131 patients.

The collection of data was achieved through the use of a structured interview schedule which mainly focused on the child, caregiver and health facility related factors that were associated with the health outcome of diarrhoea among the admitted children. Secondly, an independent ward inventory checklist was used in the determination of the staff-patient ratio and the availability of resources used in the management of children with diarrhoea.All participants who fit the inclusion criteria were enrolled upon admission and upon discharge, death or transfer the file of the patient was utilized in order to capture the patient's duration of hospitalization and the outcome. A pre-test of the questionnaire was conducted in Portreitz Hospital in Mombasa County which was conducted in order to ensure its validity and reliability

Before entry, all interview schedules were checked for completeness, internal consistency and clarity and coded in order to make it easier to for data processing and analysis. SPSS version 20 was the entry and analysis of the data. Descriptive statistics were provided in the form of means and standard deviations for continuous data or frequencies and percentages for categorical data. The bivariate relationship that were associated with the health outcomes and other factors were assessed through the Spearman's rank-order correlation. All variables that were found to be associated with the occurrence with health outcome at the bivariate level were considered together using binary logistic regression. The unadjusted and adjusted odds ratios at 95% confidence intervals were also reported. Variables that were statistically significantly associated with the dependent variable in the adjusted analysis were also included in the study. The level of statistical significance was set at $p<0.05$ and all tests were two-sided.

## 3.0 RESULTS

### 3.1 Diarrhoea Experience

The findings showed that majority (57.4%) of children experienced 3 to 4 bowel movements in the previous 24 hours while only 3.1% experienced 10 or more bowel movements. The health outcome for the respondents was characterized by either discharge 75.0%) or death (25.0%) after their admission and management. This translated to at least 1 in 4 infants dying as a result of diarrhoea upon admission.

The Spearman's rank-order correlation coefficient which was used in the analysis of the bivariate relationships between diarrhoea and health outcome (death or discharge) among the respondents revealed a number of variables which were associated with health outcome; Type of diarrhoea ($\rho$=0.190, p=0.030; those with persistent diarrhoea or dysentery were more likely to die) and degree of dehydration ($\rho$=0.309, p<0.001; children with severe dehydration or shock were more likely to die). Other variables that followed a similar trend included: Level of consciousness

($\rho$=0.278, p=0.001; those who were unresponsive were more likely to die); and Capillary refill ($\rho$=0.195, p=0.026; those will capillary refill of more than 3 seconds were more likely to die). On the other hand, nutrition oedema had a strong negative correlation with diarrhoea health outcome ($\rho$=-0.439, p<0.001; those who with nutrition oedema were more likely to die).

## 3.2 Child-Related Factors

The results revealed that among the total of 134 children who were admitted in the study the age range was between 1-108 months (*M*=14.0, *SD*=15.0) with a weight range of 2-24 kilograms (*M*=8.4, *SD*=3.4). The children were placed on oxygen between 2 to 480 hours (*M*=56.0, *SD*=81.0) and a MUAC mean of 13.15 centimetres (*SD*=10.48). A Spearman's rank-order correlation coefficient was conducted to find the bivariate relationships between child-related factors and health outcome (death or discharge) among the respondents. The following are the results that were captured from the analysis: Age in months ($\rho$=-0.251, p=0.004; younger children were more likely to die) and Current weight in kilograms ($\rho$=-0.231, p=0.008; children with lower weight were more likely to die). Other variables that followed a similar trend included: Respiratory rate on admission ($\rho$=-0.347, p<0.001); patient being put on oxygen ($\rho$=-0.419, p<0.001); Number of hours spent on oxygen ($\rho$=-0.356, p=0.012), Heart rate on admission ($\rho$=-0.378, p<0.001) and MUAC ($\rho$=-0.226, p=0.009).

## 3.3 Health Facility-Related Factors

Findings on the child medical history revealed that more than three-quarters (78.9%) of the children were received through the casualty department, with the rest coming through the MCH department. Only 12.7% of the patients were referrals. Upon admission the patients received a combination of different therapies which included intravenous (IV) fluids, paracetamol, oxygen and oral rehydration salts (ORS) and other therapies which are summarized in Figure 1 and Figure 2. The caregivers were only required to purchase drugs in 2 cases (98.5%) and in relation to adherence 15.8% of the children missed out on at least one dose of medication. Lastly, among those who missed, 66.7%, missed out on injectable or IV drugs. The bivariate analysis revealed that with the exception of the variable of comorbidities ($\rho$=0.237, p=0.006; those who had malnutrition or pneumonia as comorbidity were more likely to die). However, none of the other facility-related factors were associated with diarrhoea health outcome.

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**Figure 1: Commonest Diarrhoea Management Therapy by the Admitting Department**



**Figure 2: Commonest Diarrhoea Management Therapy in the Ward**

## 3.4 Caregiver-Related Factors

A majority of the mothers were aged 20-35 years (n=71, 53.8%) who had attained at least secondary education (n=56, 42.4%). The net income of a majority of the caregivers was more the 15,000 (n=40, 38.5%) with a majority of the mothers utilizing to chlorinated water (n=52, 39.1%). More than three-quarters of the mothers were not employed (n=114, 86.4%) and were aware of diarrhoea prevention methods (n=128, 98.5%) and sought health services from private clinics (n=74, 57.8%). A summary of the caregiver factors are shown in Table 1.

The bivariate analysis conducted, only the mother's marital status ($\rho$=0.203, p=0.021; children of single mothers were more likely to die) and paternal education level ($\rho$=0.245, p=0.007; children whose fathers were more educated were more likely to die) were correlated with diarrhoea health outcome.

**Table 1: Caregiver Socio-demographic Characteristics**

| Characteristic | Category | n | % |
|---|---|---|---|
| Age of the child's mother | 15-20 | 6 | 4.5 |
| | 20-25 | 36 | 27.3 |
| | 25-35 | 71 | 53.8 |
| | >35 | 19 | 14.4 |
| Level of education of the mother | Never attended school | 17 | 12.9 |
| | Primary level | 46 | 34.8 |
| | Secondary level | 56 | 42.4 |
| | College level | 13 | 9.8 |
| Mother's marital status | Married | 123 | 93.2 |
| | Single | 9 | 6.8 |
| Paternal education level | Illiterate | 2 | 1.6 |
| | Primary | 12 | 9.8 |
| | Secondary | 52 | 42.6 |
| | College | 56 | 45.9 |
| Approximate total monthly net income | <KSH5000 | 4 | 3.8 |
| | KSH5000-10000 | 27 | 26.0 |
| | KSH10000-15000 | 33 | 31.7 |
| | >KSH15000 | 40 | 38.5 |
| Source of water | Piped | 72 | 54.1 |
| | Borehole | 32 | 24.1 |
| | Other(specify) | 2 | 1.5 |
| | Both piped & borehole | 27 | 20.3 |
| Preparation of drinking water | Boiled | 12 | 9.0 |
| | Chlorinated | 52 | 39.1 |
| | Other | 1 | 0.8 |
| | Drink as it is | 58 | 43.6 |
| | Mineral water | 8 | 6.0 |
| | Both chlorinated & drink as is | 2 | 1.5 |
| Mother employed | Yes | 18 | 13.6 |
| | No | 114 | 86.4 |
| Aware of diarrhoea prevention | Yes | 128 | 98.5 |
| | No | 2 | 1.5 |
| Place initially sought help | Hospital | 4 | 3.1 |
| | Pharmacy | 12 | 9.4 |
| | Health centre | 15 | 11.7 |
| | Private clinic | 74 | 57.8 |
| | Traditional healers | 0 | 0.0 |
| | Family friends | 2 | 1.6 |
| | Shop | 1 | 0.8 |
| | Community health worker | 0 | 0.0 |
| | Nowhere | 18 | 14.1 |
| | Pharmacy & shop | 1 | 0.8 |
| | Health centre & traditional healers | 1 | 0.8 |

## 3.5 Factors Associated with Diarrhoea Health Outcomes

All the variables that were statistically significantly correlated with diarrhoea health outcome, were considered together using binary logistic regression. The results of the regression analysis are shown in Table 2. Several factors were associated with the risk of death from diarrhoea in the bivariate (unadjusted) logistic regression. These include age (OR=0.90, CI: 0.84-0.97; p=0.008) and current weight in kilograms (OR=0.90, CI: 0.84-0.97; p=0.008), where lower values were associated with higher odds of death. Compared to those with low respiratory rate and low heart

rate on admission, those with high respiratory rate (OR=11.00, CI: 1.10-109.67; p=0.041) and high heart rates (OR=11.67, CI: 1.30-104.82; p=0.028) had a higher odds of death, respectively. Further, those children who required oxygen had a higher odds of death (OR=7.92, CI: 3.20-19.65; p<0.001), than those who did not require it. Compared to children with a capillary refill of more than 3 seconds, those with a capillary refill of less than 2 seconds had a lower odds of death (OR=0.09, CI: 0.01-0.90; p=0.040). Marital status also followed a similar trend where children whose mothers were married had a lower odds of death (OR=0.22, CI: 0.06-0.87; p=0.032) compared to children of single mothers. None of the variables remained statistically significant in the multivariate (adjusted) analysis.

**Table 2: Factors Associated with Diarrhoea Health Outcome**

| Variable | Category | Unadjusted | | | Adjusted | | |
|---|---|---|---|---|---|---|---|
| | | OR | 95% CI | p-value | AOR | 95% CI | p-value |
| Age | | 0.90 | (0.84-0.97) | **0.008** | 0.90 | (0.79-1.03) | 0.129 |
| Current weight (in kg) | | 0.79 | (0.67-0.94) | **0.007** | 0.98 | (0.69-1.38) | 0.891 |
| Respiratory rate on admission | Above normal | 11.00 | (1.10-109.67) | **0.041** | 1.66 | (0.08-32.54) | 0.739 |
| | Normal | 1.25 | (0.14-10.91) | 0.840 | 0.59 | (0.04-9.51) | 0.713 |
| | Low | 1 | Ref | | 1 | Ref | |
| Patient on oxygen | Yes | 7.92 | (3.20-19.65) | **<0.001** | 3.83 | (0.97-15.22) | 0.056 |
| | No | 1 | Ref | | 1 | Ref | |
| Heart rate on admission | High | 11.67 | (1.30-104.82) | **0.028** | 4.41 | (0.31-62.57) | 0.273 |
| | Normal | 1.43 | (0.17-12.27) | 0.745 | 0.74 | (0.06-9.23) | 0.817 |
| | Low | 1 | Ref | | 1 | Ref | |
| MUAC | | 0.87 | (0.75-1.02) | 0.080 | | | |
| Type of diarrhoea | Acute | $4.64\times10^8$ | 0 | 0.999 | | | |
| | Persistent | $4.04\times10^9$ | 0 | 0.999 | | | |
| | Dysentery | 1 | Ref | | | | |
| Degree of dehydration | None | 0.08 | (0.01-1.03) | 0.053 | | | |
| | Some | 0.33 | (0.07-1.62) | 0.171 | | | |
| | Severe | 1.24 | (0.23-6.62) | 0.803 | | | |
| | Shock | 1 | Ref | | | | |
| Nutrition oedema | Yes | 36.56 | (4.23-315.43) | 0.001 | | | |
| | No | 1 | Ref | | | | |
| Level of consciousness | Awake | 0 | 0 | 0.999 | | | |
| | Verbal stimuli | 0 | 0 | 0.999 | | | |
| | Pain stimuli | 0 | 0 | 0.999 | | | |
| | Unresponsive | 1 | Ref | | | | |
| Capillary refill | <2 seconds | 0.09 | (0.01-0.90) | **0.040** | 1.70 | (0.07-43.66) | 0.748 |
| | 2-3 seconds | 0.18 | (0.02-2.15) | 0.177 | 0.66 | (0.02-21.85) | 0.817 |
| | >3 seconds | 1 | Ref | | 1 | Ref | |
| Comorbidities | Vomiting | 0.10 | (0.01-2.11) | 0.140 | | | |
| | Convulsions | 0.25 | (0.01-5.99) | 0.392 | | | |
| | Meningitis | 0.20 | (0.01-6.66) | 0.368 | | | |
| | Respiratory | 3.00 | (0.08-107.45) | 0.547 | | | |
| | Malnutrition | 0.27 | (0.01-5.77) | 0.404 | | | |
| | None | 0.35 | (0.02-6.24) | 0.473 | | | |
| | Pneumonia | 0 | 0 | 0.999 | | | |
| | Anaemia | 1.38 | (0.07-25.43) | 0.831 | | | |
| | Oral rush | 1.00 | (0.02-50.40) | 1.000 | | | |
| | Malaria | 1 | Ref | | | | |
| Marital Status of mother | Married | 0.22 | (0.06-0.87) | **0.032** | 0.38 | (0.03-4.45) | 0.442 |
| | Single | 1 | Ref | | 1 | Ref | |
| Paternal education level | Illiterate | 0 | 0 | 0.999 | | | |
| | Primary | 0 | 0 | 0.999 | | | |
| | Secondary | 0.46 | (0.18-1.14) | 0.094 | | | |
| | College | 1 | Ref | | | | |

## 4.0 SUMMARY AND CONCLUSIONS

### Summary

### Diarrhoea Experience and Health Outcome

The findings which were captured from the study revealed that the children experienced at least about 3-4 bowel movements in an average day. This relates to the findings conducted by WHO which revealed that diarrhoea is characterized by the passage of watery stool two or more times in a day (1). Another study which was conducted among developing countries revealed that diarrhoea is associated with the passage of watery stool in at least two times in 24 hours (13).

Secondly, one in four of the children who were admitted in the health facility had died as a result of diarrhoea. A study which was conducted to determine the association between the diarrhoea and health outcomes among infants in Bangladesh revealed that 1 out four who were hospitalized were likely to die due to diarrhoea if it was not detected and treated in a timely manner (14).The Spearman's rank-order correlation also revealed that children who experienced diarrhoea with dysentery were more likely to die contrary to their counterparts. Additionally, children who experienced severe dehydration, those who were unresponsive, infants with capillary refill of more than 3 seconds and those with nutrition oedema were more likely to die. These findings relate to a study which revealed that infants aged 2-59 months are more likely to die as a result of diarrhoea during the post discharge phase (15). Another study also noted that severe dehydration causes an abrupt malfunction of the body which is associated with death and disability of the infant (7). Similarly, an increase in the capillary refill time is associated with dehydration which a major cause of mortality among infants (16). These findings however conflict with a study conducted by van der Westhuizen et al., who revealed that there is no association between severe dehydration and the death of infant experiencing diarrhoea (3).

### Child-Related Factors Associated with Diarrhoea Health Outcome

On the second objective, age was found to be a factor that was associated with the mortality of infants due to diarrhoea. Infants who are less than a year old are more likely to die due to diarrhoea upon their admission to the health facility (17). Another study revealed that the risk of infant mortality as a result of diarrhoea is associated increases with the age of the infant (18).

The study also found weight of the infant to be associated with the mortality due to diarrhoea. This relates to the findings of a study conducted in India which reveal that infants who were not exclusively breastfed, underweight with malnutrition complications to die due to diarrhoea (19). Additionally, age, weight and the gender are associated with an increase in the prevalence of mortality due to diarrhoea (20).

Other child-related factors which were found to be associated with the occurrence of diarrhoea health outcomes included low respiratory rate and a capillary refill time of more than 3 seconds. Jarrett et al., reveals that there is a significant relationship between the respiratory rate of the infant and mortality attributed to diarrhoea (21). In relation to capillary refill time, a study conducted in Ethiopia revealed that a capillary refill of more than 2 seconds was associated with mortality of the infants with diarrhoea associated with rotavirus (22).

## Facility-Related Factors Associated with Diarrhoea Health Outcome

On the third objective, none of the facility-related factors were found to be associated with diarrhoea health outcomes among the infants in the facility. However, a study conducted in sub-Saharan Africa revealed that there is poor utilization of health services as most caregivers preferred to seek these services from traditional which predisposes the baby to significant health risk (9). Another study also noted that health workers poorly adhered to the WHO recommendations on diarrhoea management which was associated with the level of mortality among infants (9).

## Caregiver-Related Factors Associated with Diarrhoea Health Outcome

The fourth objective of the study aimed to determine the caregiver-related factors associated with diarrhoea health outcome. The findings however noted that only marital status of the mother was associated with the diarrhoea health outcome. Other studies however note that the income, level of education and age of the mother are associated with mortality and morbidity of the infants (23,24). Another study also noted that poor health seeking behaviour from the mothers was significantly associated with morbidity and mortality among infants with diarrhoea (25).

In China, the hospitalization of infants due to diarrhoea was associated with low levels of education of the mother, middle income and poor feeding practices (18). Another study also noted that mothers with infants who are twelve months old and have low level of education and from large families are largely to be subjected to the risk of diarrhoea (26). Poor home management, knowledge and practices on diarrhoea among mothers is associated with the occurrence morbidity and mortality among their infants (27).

## Conclusions

The study revealed that the child related factors associated with were significantly associated health outcome diarrhoea were the child's age, current weight in kilograms, respiratory rate, capillary refill and children who required oxygen.None of the facility related factors were found to be significantly associated with the health outcome while marital status was found to be the only caregiver-related with health outcomes of diarrhoea.

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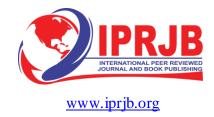
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