

Risk Factors and Mortality Rate of Acute Cancreum Oris (noma) in Sokoto North-West Nigeria: A 13-year Survey

Abstract

Noma is commonly seen in children with extreme poverty, severe malnutrition, and limited access to quality health care. To review the records of children with acute noma and associated risk factors at Noma Children Hospital, Sokoto, North-West Nigeria. A retrospective study of acute noma at Noma Children Hospital, Sokoto between 1999 and 2011. Age, gender, associated risk factors, and number of deaths were retrieved and data analyzed using IBM SPSS Statistics for Windows Version 20 (Armonk, NY: IBM Corporation, NY, USA). Correlation and linear regression analyses were conducted to examine the relationship between risk factor and mortality. Results were presented as simple frequencies and descriptive statistics. Statistical significance was set at $P < 0.05$. A total of 159 cases had acute cancreum oris during the study. Mean age was 3.34 ± 2.2 . There is female preponderance with a female to male ratio of 1.24:1. Measles as risk factor constitute the majority of the patients 75 (47.2%), followed by protein-energy-malnutrition 67 (42.1%). No risk factor in 11 (6.9%) cases. One hundred and twenty patients (75.5%) survived the disease while 29 (18.2%) died. Measles and malnutrition have been identified as the most common risk factors, and mortality rate of 24.5% reported. Efforts should be made by medical professionals to correct acute malnutrition.

Keywords: *Acute cancreum oris, protein-energy-malnutrition, risk factors*

Introduction

Cancreum oris also known as noma^[1] was derived from the Greek word “νομή,” which means to graze or to devour.^[2,3] Noma which is an infectious lesion destroys the facial and oral tissues and surrounding structures.^[4] Initially, it had a high mortality rate ranging from 70% to 90%, if not swiftly managed,^[1,3,5] however, with the advent of antibiotics the mortality rate has reduced to 8%–10%.^[6,7] The disease was known since the time of Hippocrates and was also widely reported in 18th and 19th centuries in European and North American writings.^[3] Except for isolated cases of noma found in concentration camps of Belsen and Auschwitz, the disease has disappeared in influential developed nations since the 20th century.^[8] Recently, it has been seen in patients with human immunodeficiency virus infection/acquired immunodeficiency syndrome.^[9] The disease has no gender predilection because it is associated with hunger. Noma/cancreum oris: Is a disease of the poor and the downtrodden in the

society with little or no access to water and health facilities.^[5] It is the most severe form of the infective gangrene of the cheek, mouth, and the face [Figures 1-3]. The majority of its victims are children under the age of 5 years. The disease can lead to death because of rapid evolution of disease, ignorance of the family, and health personnel in early identification of the disease.^[10] The purpose of the current study is to review the records of children with acute cancreum oris and associated risk factors and mortality at Noma Children Hospital, Sokoto, North-West Nigeria.

Materials and Methods

This is a hospital-based retrospective study conducted on consecutive patients diagnosed with acute cancreum oris (noma) in Noma Children Hospital, Sokoto, between 1999 and 2011. Sokoto state is located in the North-West corner of Nigeria bordered by Niger Republic, Republic of Benin, Kebbi State, Zamfara and Katsina States. The estimated population of the state in the 2006 general population census was

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3.7 million, >75% of the residents are rural dwellers. Over three-quarter of these rural dwellers are uneducated and mostly farmers in crops and animals. Information extracted from their case note included age, sex, and childhood illnesses suffered by the child before the presentation and survival. Protein-energy malnutrition (PEM) was determined using anthropometrics. Ethical clearance for the study was duly obtained from the management of NOMA Children Hospital, Sokoto, North-West Nigeria. Data were analyzed using IBM SPSS Statistics for Windows Version 20 (Armonk, NY: IBM Corporation, NY, USA) and results were presented as simple frequencies and descriptive statistics. Correlation and linear regression analyses were conducted to examine the relationship between risk factor and mortality. Statistical significance was set at $P < 0.05$.

Results

A total of 159 cases were diagnosed with acute cancrum oris during the study. Mean age was 3.34 ± 2.2 years. Age group 0–5 years had the bulk of the patients 141 (88.7%) [Table 1]. The highest number of deaths was recorded in the age group 0–5 years [Figure 4] although not statistically significant ($P = 0.171$). There is female preponderance with a female to male ratio of 1.24:1. One hundred and twenty patients (75.5%) survived the disease while 29 (18.2%) died (mortality rate of 24.5%) [Table 2]. Of the 120 survivals 62 (70.5%) were females, while 58 (81.7%) were males and of the 29 deaths, 21 (23.8%) were females while 8 (11.3%) were males [Figure 5]. No statistically significant difference between survival rates and gender ($P = 0.123$). Patients with measles as risk factor constitute the majority of the patients 75 (47.2%), closely followed by patients with protein-energy-malnutrition of 67 (42.1%) [Table 3]. No associated risk factor in 11 (6.9%) cases. Most of the deaths (13 [44.8%]) were associated with measles which was closely followed by PEM (12 [41.4%]) with no statistically significant difference ($P = 0.052$) [Table 4]. There is no statistically significant correlation between risk factors and mortality



Figure 1: Clinical photograph showing dark necrotic tissue on the left cheek

rate. The linear regression model with risk factor predictor produced; $R^2 = 0.001$, $F = 0.102$, and $P = 0.750$.

Discussion

Disease burden and health status of any community are an interaction of behavior of individuals and the environment.^[4] Studies have identified poverty as the most important risk factor for the development of cancrum oris in underdeveloped nations especially sub-Saharan Africa where there is high rate of chronic malnutrition, lack of portable drinking water, poor environmental and personal sanitation, high contact with viral, and bacterial pathogens are major predisposing factors.^[1,4,11] Natural history of noma involves two phases (Acute inflammatory phase and chronic phase).^[12] Morbidity and mortality are closely associated

Table 1: Sociodemographic profile of patients

Age	Female	Male	Total
0-5	78	63	141
6-10	8	8	16
11-15	1	0	1
16-20	1	0	1
Total	88	71	159

Table 2: Distribution of mortality among patients

Complications	Frequency (%)
Survived	120 (75.5)
Died	29 (18.2)
No record	10 (6.3)
Total	159 (100.0)

Table 3: Distribution of comorbidities among patients

Comorbidities	Frequency (%)
Measles	75 (47.2)
Protein-energy-malnutrition	67 (42.1)
Gastroenteritis	2 (1.3)
Whooping cough	3 (1.9)
Retroviral disease	1 (0.6)
None	11 (6.9)
Total	159 (100.0)

Table 4: Distribution of comorbidities and survival rates of patients

Co-morbidities	Complications			Total
	Survived	Deaths	No data	
Measles	61	13	1	75
Protein-energy-malnutrition	49	12	6	67
Gastroenteritis	2	0	0	2
Whooping cough	1	2	0	3
Retroviral disease	1	0	0	1
None	6	2	3	11
Total	120	29	10	159

$P=0.052$



Figure 2: Clinical photograph showing sloughing off of dark necrotic tissue on the left cheek



Figure 3: Clinical photograph showing exposed mandible and maxilla

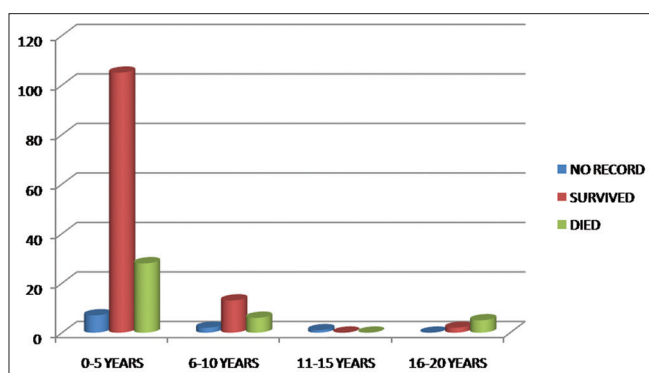


Figure 4: Survival and age group of patients with acute noma

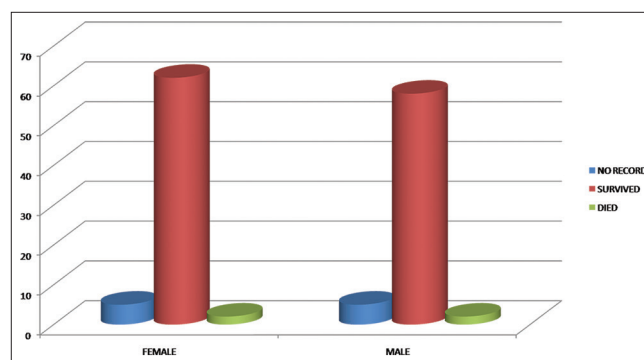


Figure 5: Survival and gender of patient with acute noma

with the acute phase of the disease where survival is the main treatment goal. Acute noma is still a major health challenge in Northern Nigeria.^[12] Risk factor associated with the current study was measles and PEM (75 [47.2%] and 67 [42.1%]), respectively. These two conditions have been previously reported as the major predisposing factor in the etiology of noma.^[3,4,13,14]

Measles which is a viral infection caused by paramyxovirus of the genus morbillivirus have been isolated in the down-regulation of interleukin-12 responsible for the production of cell-mediated immunity causing immunosuppression.^[15] The virus also infects and damages epithelial tissues.^[16] Measles virus lives in the mucus of the nose and throat of an infected child or adult. Research has shown that there is a high risk of developing deep erosive ulcers in the mouth and eyes in malnourished children with vitamin A deficiency after measles infection.^[17,18] Complicating this health challenge is that most of the children in these Sokoto rural communities have poor uptake of vaccines against childhood diseases.^[4]

Other major health problems of the people from this region include malaria, tuberculosis, pneumonia, and diarrhea.^[19] People residing in this impoverished rural area in Sokoto

specifically, live in poorly ventilated thatched roof and dirty floors houses in close to domestic animals.^[4] They also obtain drinking water from contaminated shallow wells.^[1]

PEM was the second most common predisposing factor in noma in the current study. PEM has been reported in previous studies as a major factor for the development of noma.^[4] Malnutrition leads to an alteration in cell-mediated immune function with rapid breakdown of the epithelial tissues.^[20,21] Alterations in the oral mucosa facilitate invasion by pathogens.^[20] The previous study in these rural Sokoto communities confirmed the strong association between PEM and noma.^[4] An earlier report from these communities showed that amino acid profiles are consistent with PEM syndrome.^[22] It has also been reported that viral infections is more severe in the malnourished child which may lead to linear growth retardation.^[23-25] Similarly, Beck^[26] in his study concluded that chronic malnutrition can alter the genotype of a virus leading the production of more powerful strains. Furthermore, the impact of the disease on the dental and oral health of these children which include; feeding difficulties, poor oral hygiene, dental caries, and desiccated oral mucosa will additionally worsen the PEM.

Although no statistically significant correlation was seen between risk factors and mortality rate following linear

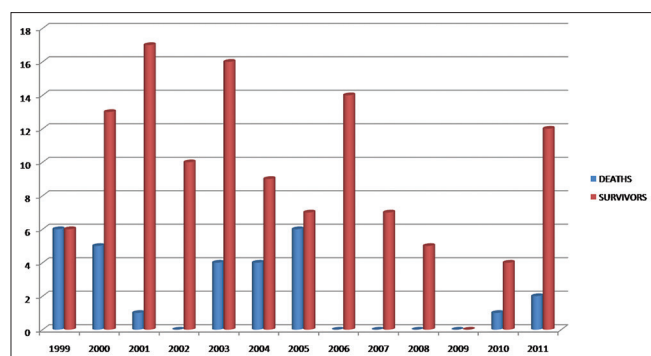


Figure 6: Mortality and morbidity of acute noma cases according to year of presentation

regression analysis, this study identified a mortality rate of 24.5% far more than the reported range of 8%–10% in this antibiotic era, even though in the preantibiotic era, mortality rate was as high as 70%–90%.^[1] We opined that other confounding factors could have been responsible for this rate. We also noticed from the study that the entire 6 (20.7%) patients that presented in 1999 died [Figure 6]. This year coincides with the new democratic dispensation in Nigeria, and the undue hardship experienced at that time grossly manifested in children welfare and nutrition. Similar findings has been reported by Oginni *et al.*^[27] in Ile-Ife, a semi-urban town in the South-West region of Nigeria where the highest number of acute cancrum oris was seen during the period of structural adjustment program which affected the socioeconomic status and the nutritional condition of the children.

Conclusion

Measles and PEM have been identified as the most common risk factor in our survey and mortality rate of 24.5% reported. The prevention of cancrum oris (Noma) in African children especially in Sokoto North-Western region of Nigeria cannot be overemphasized. These interventions should focus on addressing severe malnutrition, adequate immunization against early childhood diseases, decreasing exposure to infectious diseases by separating human and animal leaving in close. Furthermore, the rapidly deteriorating sanitation should be addressed and abject poverty eradicated.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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