

ANNOTATED BIBLIOGRAPHY ON NOMA BY THE WORLD HEALTH ORGANIZATION

PART I GENERAL PUBLICATIONS

Barnes D. E., Enwonwu C. O., Leclercq MH, Bourgeois D, Falkler WA. The need for action against oro-facial gangrene (noma). *Tropical Medicine and International Health* 1997; 12: 1111-1114.

This editorial presents a synthesis of the origins of noma, the risk factors and causes of the disease, the magnitude of the problem, the evolution of the disease and its sequelae. The authors conclude on the spread of the disease worldwide and urgent needs in the area of detection, treatment and research, the need to intensify the campaign against noma launched by the WHO in 1994.

Bourgeois D. M., Leclercq M. H. The World Health Organization initiative on noma. *Oral Diseases* 1999; 5:172-174.

According to the 1998 World Health Report, noma is a world scourge, with a global incidence of 140 000 cases, and a prevalence of 770 000 persons surviving with serious sequelae in 1997. The background and five steps of the World Health Organization Initiative on Noma are also presented in the article.

Costini B, Larroque G, Duboscq JC, Montandon D. Noma ou cancrum oris: aspects étiopathogéniques et nosologiques. *Médecine tropicale* 1995; 55 (3): 263-73.

The authors start by giving some background information on noma in children and more atypically in adults. They foresee a possible increase in noma cases in developing countries because of the increasing number of wars and spread of the aids epidemic. They also discuss the risk factors associated with etiopathogenesis of noma.

Dawson J. Cancrum oris. *British Dental Journal* 1945 79(6): 151-157.

This article illustrates the evolution over time of the geographical distribution of noma. Formerly frequent in North America and Europe, the disease is now spreading in developing countries. The author, who belongs to the Medical Corps of the Royal Army of England reports a series of cases of noma observed in internees at the Belsen concentration camp during the Second World War. The disease, which was then rare in this part of the world, was mainly observed in extremely debilitated subjects. Having obtained the permission to group patients from the camp in the same hospital, the author describes 10 cases of noma: all the patients are of the female sex, in an extremely severe state of malnutrition and suffering from general deficiency in vitamins. The other conditions observed were mainly pulmonary tuberculosis and typhus. The author goes on to present the evolution and prognosis of the disease, as well as the therapeutic approaches, focusing on treatment with and without penicillin.

Dickson M. Noma. In: *Là où il n'y a pas de dentiste. Dakar, ENDA, 1990:181-186.*

This is the French version of the book "Where There is No Dentist", published in 1983 by the same author. It is intended for health workers operating at the peripheral level of the health system, especially "Where there is no dentist". Part of chapter 7 entitled "Treating some common problems" is devoted to noma. The author presents the disease, the symptoms as well as treatment and prevention of noma. The treatment starts by correcting dehydration, followed by treatment of the anaemia, antibiotic therapy, cleaning and dressing of the wound, extraction of mobile teeth and the necrotized bone, and oral hygiene. The section ends with some advice on orientation of the child to a doctor and/or a dentist. The section on "prevention" proposes simple approaches for avoiding noma.

Enwonwu C. O. Noma: a neglected scourge of children in sub-Saharan Africa. *ulletin of the World Health Organization* 1995; 73: 541-545.

Noma, a severe gangrene of the soft and hard tissues in the mouth, the face and surrounding part, is a real scourge in sub-Saharan Africa that is still neglected. The major risk factors are: poverty, malnutrition, poor oral hygiene, general weakness caused by diseases like HIV infection, measles and other current childhood illnesses in the tropics. The escalation of the incidence of noma in Africa could be attributed to aggravation of the economic crisis in the region and its harmful effects on child health and welfare, the nutritional status and related immunosuppression, as well as greater exposure to infectious diseases. The prevention of noma implies the adoption of measures to eliminate these causes, particularly preventing the contamination of food and water supply by faeces.

Enwonwu C. O., Falkler W. A. Jr, Idigbe E. O., Savage K. O. Noma (cancrum oris): questions and answers. *Oral Diseases* 1999; 5(2):144-149.

In this article, the authors try to provide answers to numerous interrogations concerning noma. The main themes treated are: definition of the problem, clinical presentation, progress and sequelae, differential diagnosis, risk factors, pathogenesis of noma. This synthesis shows that noma occurs generally in sub-Saharan Africa among children from 2 - 16 years, and the estimated frequency in some communities would be 1 - 7 cases for 1000. The major risk factors are poverty, malnutrition, inadequate oral hygiene, deplorable environmental conditions, proximity with livestock, and infectious diseases, especially measles. Current researches suggest that a group of micro-organisms, including *Fusobacterium necrophorum* and *Prevotella intermedia* would account for the passage from necrotizing ulcerative gingivitis to noma. Without appropriate treatment, the mortality rate would be 70 - 90%. Not all mutilated survivors benefit from reconstructive surgery, and consequently suffer from the dual impact of facial mutilations and functional sequelae.

Falkler W. A. Jr, Enwonwu C. O., Idigbe E. O. Microbiological understandings and mysteries of noma (cancrum oris). *Oral Diseases* 1999; 5(2):150-155.

The article starts by reviewing the microbiological history of noma. Several theories and different studies have associated the disease process with a great number of micro-organisms. The authors then analyse the different studies conducted among malnourished Nigerian children suffering from necrotizing ulcerative gingivitis or noma. They also examine the pathogenic mechanisms of *Fusobacterium necrophorum*, the micro-organism responsible for noma.

Grappin G., Le Coustour L. Noma. Encyclopédie Médico-Chirurgicale, Paris, Stomatologie, 1978; 6; 22045 L-10.

In this article published in 1978, the authors describe the state of knowledge on noma, starting with the history of the disease. They go on to discuss the following themes: epidemiology (geographical distribution, age, sex, climatic factors); etiology (nutritional deficiencies, infectious diseases, parasitoses, periodontal status and oral hygiene); microbiology; clinical study; pathological anatomy; diagnosis; sequelae; etiopathogenic hypotheses; treatment (emergency treatment, secondary treatment, i.e. antibiotic therapy and local treatment; surgical treatment of sequelae); and preventions.

Leclercq M. H. Can dentistry tackle inequality? The challenge of Noma. FDI World 1999; 2: 9-13.

The author - former responsible of the WHO International Action Programme against Noma - presents a description of noma and the International Action Programme against the disease. Adopted in 1992, the WHO Initiative against noma comprises 5 elements: prevention and early detection; first level care; information dissemination and public education; epidemiological and etiological research; treatment of the sequelae of the disease. Following this strategy, the WHO Director General, in 1994, called for the formation of an international network on the fight against noma. In 1999, this network comprised 5 foundations, three research organizations, four professional associations, six WHO collaborating centres, seven universities, thirteen philanthropic organizations and several hospitals. WHO's action plan for Africa, based on the following points, was then presented: training, intensification of the sensitization of the public; production of hygiene education materials; campaign on detection of acute necrotizing gingivitis and noma; production and dissemination of materials for treating the disease; programmes in epidemiological and etiological research.

Marck K. W., de Bruijn H. P. Surgical treatment of noma. Oral Diseases, 1999; 5 (2): 167-171.

This document summarizes the state of knowledge on surgical care and treatment of noma. In the early stages of the disease, surgery does not play a major role. It generally consists in reating the wounds and occasionally haemorrhages. On the other hand, reconstructive surgery plays a decisive role among survivors with mutilated faces. For economic reasons, and purposes of education and training, the authors recommend that these operations should be performed locally in the countries concerned. In conclusion, due to the great diversity of affected tissues and existing surgery options, the authors recommend the development of a standardized approach to reconstructive surgery to treat sequelae of noma.

Montandon D, Lehmann C, Chami N. The surgical treatment of noma. Plastic and Reconstructive Surgery 1991; 87(1): 76-86.

The authors recount their experience of surgical treatment of noma. They describe in particular, the case of 8 children from Africa. Aged 2-9 years, who were operated in the Unit of Plastic and Reconstructive Surgery of the Geneva Hopital Cantonal Universitaire (Switzerland). After a series of complex operations, the patients were able to return to their homes with spectacular improvement, both functionally and aesthetically. However, a satisfactory oral cavity opening could not be obtained in all the cases.

Reynaud J. Le noma chez l'enfant africain. L'enfant en milieu tropical. Paris: Centre international de l'enfance 1965; 26: 11-17.

How to define noma? This is one of the questions to which the author tries to provide answers in this article. He first analyses the etiological circumstances and mode of onset of the disease: generally in the child aged 3 - 5 years, with clear predominance among girls, during the regression phase of some serious diseases like measles. It evolves very rapidly and the initial phase is very rarely seen in hospital setting. During the gangrenous phase, fetidness of breath is a permanent feature. The treatment of noma basically relies on: nutritional supplementation, antibiotic therapy, local care and surgical treatment in some cases. Access to reconstructive plastic surgery is more limited in Africa. The article ends with a discussion of vital and functional prognosis and the different etiological and pathogenic hypotheses.

Sawyer D. R., Nwoku A. L. Can crum oris (noma): past and present. ASDC Journal of Dentistry for Children 1981; 48(2): 138-141.

This literature review starts with a historical background to the geographical distribution of the disease - formerly in North America and Europe, now in some regions in Africa, Asia and South America. The authors then examine the etiological factors, clinical presentation of the disease, the histopathology and bacteriology, morbidity and mortality, the differential diagnosis and treatment.

Tempest M. N. Can crum oris. British Journal of Surgery 1966; 53(11): 949-969.

After referring to the definition of noma given by Tourdes in 1848, the author reviews: the historical background, clinical presentation, and mortality rates of can crum oris, as well as the bacteriological studies. He goes on to describe the etiological factors: age, sex, case history of predisposing diseases, malnutrition, eating habits, oral hygiene, seasonal fluctuation of the incidence of noma. Other factors like blood groups, acatalasaemia, and contagiousness of noma are also discussed. The author also analyses the differential diagnosis of noma; treatment of chronic stages of the disease, sequelae and handicaps. He makes a detailed analysis of the problems of reconstruction of sequelae, namely: principles of repair, anaesthesia, correction of trismus, repair of facial mutilations and ends with major points concerning the surgical technique.

Weaver G. H., Tunnicliff R. Noma. Journal of Infectious Diseases 1907; 4 (8): 8-35.

The two authors start by giving the historical background of noma, including the most complete definition, the one given by Tourdes in a thesis presented to the Faculty of Medicine of Strasbourg in 1848: "a gangrenous affection of the mouth especially attacking children in whom the constitution is altered by the bad hygiene and serious illness, especially from the eruptive fevers, beginning in an ulcer of the mucous membrane with oedema of the face, extending from within out, rapidly destroying the soft parts and the bone, accompanied most often by hepatization of the lungs, and almost always quickly fatal". The article goes on to provide the following details: background and frequency of the disease; etiological factors (age, sex, hygienic conditions, climate, seasons, predisposing disease, contagiousness, bacteriology); anatomopathology; signs and symptoms, particularly physical signs of the facial gangrene and other localizations, such as genital parts, the different phases and duration of the disease: the diagnosis, complications, prognosis, treatment. The article ends by presenting the clinical cases and a list of bibliographical references dating back to the 1800s.

WHO. Noma, a little-known public health problem. World Health Day, 1994 (WHD/94.6).

This document was published by the Oral Health Unit (WHO, Geneva) on the occasion of the World Health Day devoted to oral health. Noma is a disease that causes annually hundreds of thousands of deaths among children, while some thousands of survivors are disabled or disfigured for life. The document presents a synthesis of the trend of the disease from the past to the present, the passage from gingival ulceration to noma, characteristics of noma, progress of research and what should be done in the face of the disease.

WHO. Critères actuels d'aide au diagnostic clinique pour l'identification des manifestations oro-faciales du noma. WHO/ORHNOMA/October 1994.

The different phases of the evolution of noma - necrotizing ulcerative gingivitis, facial oedema, gangrenous patch, tissue loss, sequelae - are described and illustrated with colour pictures in this manual.

WHO. Noma today: a public health problem? Report of an expert consultation organized according to the Delphi method by the WHO Oral Health Programme. (WHO/MMC/NOMA/98.1), 1998: 30 pages.

This expert consultation was organized in 1993 with a view to reaching a consensus on noma, notably: definition of the disease, predisposing illnesses, determining socio-environmental factors, geographical distribution, distribution by age and sex, mortality rate and methods of prevention.

PART II PUBLICATIONS ON NOMA IN THE AFRICAN REGIONS

Adolph H. P., Yugueros P., Woods J. E. Noma: a review. Annals of Plastic Surgery, 1996 Dec; 37(6):657-68.

In this article, the authors report the experience of treatment of 50 cases of noma out of 300 patients referred to the Galmi hospital in Niger. This case study is completed by a literature review on epidemiological impact of the disease, characteristics of lesions, pathogenesis, symptoms, sequelae, differential diagnosis, pre-operating preparation, different approaches to anaesthesia, reconstruction methods, main causes of complications as well as mortality associated with the disease.

Barmes D. E., Leclercq M. H., Tapsoba H. Epidemiology of noma: a retrospective study in Zinder, Niger. American Society of Tropical Medicine and Hygiene. 48th Annual Meeting. Washington DC, 1999.

As part of the international collaborative research on noma, a feasibility study was conducted by a WHO team in Niger, one of the four countries retained to participate in the study. The data reported in this document were obtained during this mission to Zinder organized in collaboration with the Swiss NGO Sentinelles. Analysis of the data collected from 1992 to 1998 shows that 164 cases were no longer on surveillance since the patients had died (n=33) or lost to follow-up for different reasons, while 226 others were still alive. For the latter, mainly of the female sex (57 %), noma occurred before the age of 6 (91 %), especially during the weaning (up to 4 years, 69 %). A seasonal fluctuation was also observed: the peak period for onset of noma was between September and December, representing nearly twice the number of cases occurring the rest of the year. The 41 cases recorded in 1998 could be attributed to an increase in incidence of the disease or efficient sensitization of the community on the fact that noma could be cured. The data to be collected in other regions of Niger will help to conduct a more in-depth investigation of the different hypotheses generated by this retrospective study.

Bourgeois D. M., Diallo B., Friehe C., Leclercq M. H. Epidemiology of the incidence of oro-facial noma: a study of cases in Dakar, Senegal, 1981-1993. American Journal of Tropical Medicine and Hygiene 1999;61(6):909-913.

This article presents the results of a retrospective study covering period of 13 years conducted from patients' files. From 1981 to 1993, 199 cases of noma were identified, 37% of which was at the chronic age - mainly children- and the remaining 63 % at the stage of after- effects. The progressive lesions were mainly localized on the upper lips and cheeks. Only 20 % of patients at the chronic stage had good vital prognosis. According to the authors, Senegal should consider as a priority, the establishment of surveillance system for the disease.

Chidzonga M. M. Noma (cancrum oris) in human immunodeficiency virus/acquired immune deficiency syndrome patients: report of eight cases. Journal of oral and maxillofacial surgery 1996; 54(9):1056-60.

This case study reports the clinical characteristics and care of noma among eight patients infected with HIV/AIDS in Zimbabwe. The treatment consisted in minimal but deep incision of the necrotized tissue, under local anaesthesia, and washing with povidone-iodine solution. Associated with antibiotics therapy, satisfactory results were obtained in the chronic stage the disease in patients with different clinical presentation. However, it was not possible to study the long-term sequelae of noma, since the patients inevitably succumbed to the underlying HIV infection.

Diombana M. L., Kussner H., Soumare S., Doumbo O., Penneau M. Noma dans le service de stomatologie de l'hôpital national de Kati (Mali) - 22 cas. Médecine d'Afrique Noire, 1998, 45 (3) pp182-184.

The retrospective study concerns 22 patients suffering from noma aged 4 - 58 years who were admitted to the stomatology unit of Kati Hospital from January 1981 - March 1993. There was no consultation in the early phase of noma, as the patients generally reported for repair of the sequelae. The affected parts were the cheeks and lips (N=17) and the nose (N=5). Each plastic reconstruction operation was preceded by a series of biological tests. The 2 types of operations used are the ESTLANDER-ABBE method and rotation of the cheek or skin of the chin. The majority of patients operated - with 80 % success rate - left the hospital the same day and post-operation care was administered in external consultation. Twelve cases were not operated due to refusal by the patients or financial constraints.

Emslie R. D. Cancrum oris. The Dental Practitioner 1963; 13:481-495.

This study, conducted in 1963 during a mission led by the author to Nigeria (University of Ibadan Teaching Hospital, Kano in the North of the country, and to the Eastern Region of the country). The presentation of the different clinical cases is followed by a discussion on the differential diagnosis, the bacteriological studies, the onset of noma in a clean mouth, acute herpetic gingivo-stomatitis, histopathology and predisposing factors of the disease. The author concludes by recommending that prevention of noma should be based on improvement of oral hygiene, dietetic measures, early treatment of oral diseases, control of diseases like malaria, measles and smallpox.

Enwonwu C. O. Epidemiological and biochemical studies of necrotizing ulcerative gingivitis and noma (cancrum oris) in Nigerian children. Archives of oral biology 1972; 17(9):1357-71.

Biochemical and epidemiological studies were conducted in Nigerian children from 1963 to 1965 to determine the role of oral hygiene and major socioeconomic indicators in the distribution of necrotizing ulcerative gingivitis and oral lesions of noma. The 69 cases of noma identified were in children suffering from severe malnutrition, as shown by the biochemical, clinical and dietary analyses, with poor oral hygiene and originating from disadvantaged social environments.

Enwonwu C O. Infectious oral necrosis (cancrum oris) in Nigerian children: a review. Community dentistry and oral epidemiology 1985; 13(3): 190-194.

In this literature review, the author examines the factors preceding the occurrence of noma in disadvantaged children in Nigeria. These are generally chronic malnutrition and endemic communicable diseases, the most frequent being measles. In weak children, the infection develops very rapidly, crossing anatomical barriers and the necrosis spreads with the possibility of sequestration.

Falkler W. A Jr, Enwonwu C. O., Idigbe EO. Isolation of Fusobacterium necrophorum from cancrum oris (noma). American journal of tropical medicine and hygiene 1999; 60(1):150-156.

A research was conducted in Sokoto, North-Western Nigeria, to identify the predominant micro-organisms in the active phase of noma in 8 patients from 3 - 15 years. The main results show that Fusobacterium necrophorum was identified in more than 87 % of cases. It is a pathogen agent mainly associated with zoonoses, which could be of vital importance in etiology of noma and implications in animal transmission of the disease. 12

Idigbe E. O., Enwonwu C. O., Falkler W. A., Ibrahim M. M., Onwujekwe D., Afolabi B. M, Savage K. O., Meeks V. I. Living conditions of children at risk for noma: Nigerian experience. Oral Diseases 1999; 5(2):156-162.

The main objective of this study conducted in two regions of Nigeria from October 1996 to April 1998 was to determine the role of living conditions of children in the onset of necrotizing ulcerative gingivitis and noma from oral lesions. On the whole, 46 cases of fresh noma, mainly from the North-Western part of the country, and 46 cases of acute necrotizing ulcerate gingivitis from South-Eastern Nigeria were included in the study. The results show that unhealthy living conditions, proximity with livestock, exposure to debilitating childhood diseases, poor oral hygiene, limited access to potable water and absence of adequate system for evacuating faeces and animal wastes are factors that could explain why children in the North-West are at higher risk of contracting noma than those in the South-West. The study concludes that these factors also account for a higher prevalence of noma in the North- Western part of the country.

Lazarus D., Hudson D. A. Cancrum oris - a 35-year retrospective study. South African medical journal 1997; 87(10):1379-82.

This retrospective study conducted at the Red Cross War Memorial Children's Hospital in Cape Town (South Africa) covers a period of 35 years (1960-1995). It concerned a total of 26 children (16 girls and 10 boys) aged between 1 and 15 years (average age = 4 years) consulting at the plastic and reconstructive surgery department. The objective was to determine the predisposing factors of noma, frequency of the disease, clinical characteristics, treatment and results obtained. The peak period of incidence of noma was between 1971 and 1975 when 11 cases were recorded. Otherwise, the department received about one case of noma every five years, generally cases referred from the rural areas. The factors most frequently associated with the onset of noma were malnutrition, gastro-enteritis, measles and anaemia. The sequelae were mainly localized in the soft tissues (lips, cheeks, chin, nose or other structures: n=23), the other being bone or cartilaginous diseases (n=18). Only three children presented a case of bone disease. Reports on surgical interventions were available for 18 children who were operated 84 times, i.e. an average of 4.7 per child (0-12). Given the multiple procedures required by care and treatment of a child suffering from noma, the authors conclude on the need to focus on prevention, especially in primary health care.

Leclercq M. H., DE Barmes, Tapsoba H. Prevalence of oro-facial mutilations: noma and oral cleft in Tahoua, Niger. FDI World Dental Congress. Mexico City, 28 October - 1 November 1999.

Data from registers of the German NGO Hilfsaktion on facial mutilations (noma and oral cleft) were analysed in the context of an international collaborative study on noma, a joint project of the WHO, NIDCR and the University of Maryland. The data available showed that 147 cases of noma (59 % female) and 32 cases of oral cleft were recorded, representing a ratio of about 4 cases of noma to one harelip. The greatest number of cases was identified in the town of Tahoua. Surgical rehabilitation of these two types of mutilations could be organized jointly, while the network of surgical care and treatment could be extended to other diseases like oral cancers, maxillofacial burns and traumas.

Malberger E. Acute infectious oral necrosis among young children in the Gambia, West Africa. Journal of periodontal research 1967; 2 (2):154-62.

From February 1964 to March 1965, 7650 patients were received at the Royal Victoria Hospital in Bathurst (Gambia), including 50 children from 1-6 years suffering from acute oral necrotizing diseases. Six of the children were in the chronic phase of noma and only one of them survived. The other 5 died on arrival at the hospital or within the 4 days following the appearance of the symptoms. A second group of children (n=361) was examined in 4 surrounding villages to identify the determining factors of the disease: poor oral hygiene, gingivitis, high incidence of micro-organisms, malnutrition, debilitating diseases and reduction of resistance caused by infectious diseases.

Marck KW, de Bruijn HP, Schmid F, Meixner J, Van Wijhe M, R.H.M. van Poppelen. Noma: the Sokoto approach. European Journal of Plastic Surgery 1998; 21:277-281.

The article reports a 3-week mission conducted in October 1996 in Sokoto, Nigeria, by a German and Dutch medical team to initiate a surgical assistance programme in the treatment of noma. The team planned and performed 23 operations during their stay.

Montandon D, Pittet B. Humanitarian plastic surgery. Personal experience and reflections. Annales de chirurgie plastique et esthétique 1999 Feb; 44(1): 27-34.

The authors report their personal experiences in surgical care and treatment of cases of noma both in the field - Burkina Faso,

Benin, Niger and in Geneva, Switzerland, where the most complicated cases were operated. In addition to this experience, which started in the 1970s, the authors present and discuss their conception of humanitarian plastic surgery and problems resulting from it. They include notably training, choice of surgical techniques, post-operative follow-up and results obtained.

Naidoo S, Chikte UM. Noma (cancrum oris): case report in a 4-year-old HIV-positive South African child. Journal of the South African Dental Association 2000; 55(12): 683-6.

The authors report a case of noma affecting a 4-year-old HIV-positive girl in South Africa. Abandoned, she was entrusted to the child protection unit and her case history was unknown. The clinical test revealed retarded growth and physical development similar to that of a 2-year-old child. Her left cheek presented a perforated ulcer of 1 cm in diameter in curing phase. She had no fever and the examination of the oral cavity revealed generalized necrotizing ulcerative gingivitis and pronounced halitosis. A treatment, comprising chlorhexidine gluconate solution (0.2 %) and 200 mg metronidazole tablets twice a day, was prescribed for 15 days. Her state rapidly improved and she was transferred to the Johannesburg Hospital for additional treatment under general anaesthesia.

Nath S., Jovic G. Cancrum oris: management, incidence, and implications of human immunodeficiency virus in Zambia. Plastic and Reconstructive Surgery 1998; 102(2): 350-7.

This retrospective study was conducted at the University Teaching Hospital of Lusaka (Zambia). For 15 years (1979 - 1993), 81 children (29 boys and 52 girls), 58 of whom were under 3 years, suffering from noma were admitted to the paediatric plastic surgery unit. Among them, 3 refused surgery, 11 died during the initial medical treatments and 12 died after a minor early surgery. The main author of the study performed reconstructive surgery on the remaining 55 patients. Problems encountered during care and treatment - during the anaesthesia and correction of the trismus for example - as well as the implication of HIV are also discussed.

Ndiaye F. C., Bourgeois D., Leclercq M. H., Berthe O. Noma: public health problem in Senegal and epidemiological surveillance. Oral Diseases 1999; 5(2): 163-166.

The objectives of this epidemiological study conducted in collaboration with the WHO for one year in the North of Senegal were to assess the incidence of necrotizing ulcerative gingivitis, prevalence of noma and other childhood diseases, and to promote prevention strategies among the most vulnerable population groups. In the 35 health centres of the 5 departments concerned, the main results obtained were as follows: 1223 cases of malnutrition, 1058 cases of necrotizing ulcerative gingivitis, 465 of which concerned children aged 1 - 4 years, 25 cases of noma. In conclusion, the authors recommend an approach that takes into account the realities of poor countries, based mainly on information, education and communication campaigns, as well as prevention and early detection.

Oginni F. O., Oginni A. O., Ugboko V. I., Otuyemi O. D. A survey of cases of cancrum oris seen in Ile-Ife, Nigeria. International Journal of Paediatric Dentistry 1999; 9(2): 75-80.

The study is based on files of patients of a teaching hospital (Ile-Ife, Nigeria). It concerns 142 children from 2 - 16 years suffering from malnutrition and noma or presenting sequelae of noma between 1982 and 1996. The localization of the attack was more often maxillary than mandibular. Seventeen patients were successfully treated. These results confirmed those of other studies and underscored the need to fight against the underlying causes of noma and promote the use of health services.

Ouoba K, Sanou I, Dao M, Kam L, Ouédraogo A, Ouédraogo R, Sawadogo A. Progressive noma: 27 cases seen at Ouagadougou Central Hospital. Dakar Medical 1998; 43(1): 45-8

This retrospective study reports 27 cases of noma observed between 1991 and 1995 at Ouagadougou National Hospital Center, Burkina Faso. It involves 17 boys and 10 girls aged 2 - 8 years, mostly from low-income families (76 %), and suffering from malnutrition in 63% of cases. The vital prognosis seems to be linked to the intensive care and nutritional supplementation. In conclusion, the authors discuss the different aspects of prevention of the disease, which is associated with poverty: public information, sensitization of the health staff in early detection, care and treatment, improvement of living conditions and health services.

Péri G. Nomias d'Algérie. Aspects anatomo-cliniques des séquelles des gangrènes de la face survenues au cours de l'enfance chez les Algériens. Déductions thérapeutiques. Revue de Stomatologie 1965;66 (9):477-488.

In this article, the author starts by explaining the circumstances surrounding the discovery of noma. It concerns mainly children who consult for scars on the face, substance loss or permanent jaw constriction. The onset of the disease occurs generally during the regression phase of an infectious disease on an area fragilized by lack of general hygiene, nutritional imbalance and intestinal parasitoses. The author goes on to describe the different anatomic lesions observed and concludes by making therapeutic deductions, notably treatment of permanent jaw constriction, repair of cover tissues and precautions to be taken for the operation.

Sheiham A. An epidemiological survey of acute ulcerative gingivitis in Nigerians. Arch. Oral Biol 1966; 11: 937-942, 1966.

The objective of this epidemiological survey was to determine the prevalence of acute ulcerative gingivitis in children in the city of Ibadan and villages in the West and Eastern parts of Nigeria. Out of the 3507 individuals examined, 63 children from 2 - 12 years suffered from acute ulcerative gingivitis and 2 of them had noma. Six children, free from gingivitis, also presented facial mutilations characteristic of noma sequelae. The author also observes that in the city of Ibadan, 73 % of the children suffering from acute ulcerative gingivitis were living in a house where there was also another child suffering from the disease.

Smith I. Cancrum oris. Journal of maxillofacial surgery 1979; 7(4): 293-298.

The author recounts his experience in care and treatment of noma in Johannesburg (South Africa). He also analyses the predisposing factors, as well as treatment and prognosis according to the stages and forms of the disease. The mortality rate was generally very high but antibiotic therapy helped to increase the rate of survival of patients. Because of the destructive nature of the disease, the healing period is very long for survivors, who present functional disorders and disfigurement requiring reconstruction procedures at certain stages. Early detection of noma is therefore of vital importance.

Takkal AM, Ionescu G, Becker JH. Noma (Cancrum Oris) associated with Kwashiorkor: a case report and review of the literature. Acta chirurgica Belgica 1996; 96(4): 179-181.

The authors, from the University of Pretoria (South Africa), report a case of noma and present a review of the literature comprising notably the pathogenesis, bacteriological complications and treatments of this disease, which affects mainly malnourished children in developing countries.

Touré S., Siriki S, Radi E, Assi K. Surgical prosthetic approach to sequelae of a case of noma involving half the face. Odontostomatol Trop 1991; 14(1): 27-32.

In this study, which was conducted in Côte d'Ivoire, the authors analyse the prosthetic rehabilitation of substance loss due to noma.

PART III PUBLICATIONS ON NOMA IN OTHER REGIONS

Biswal N., Mahadevan S, Srinivasan S. Gangrenous stomatitis following measles. Indian Paediatrics 1992;29(4):509-511.

This case study was conducted in India. The authors report two examples that perfectly illustrate the onset of noma during the regression phase of an episode of measles. The first case involves a 7 year-old girl weighing only 13 kg, with purulent discharge and fetid of the left jaw which appeared 40 days after contracting measles. The child was not sent to the hospital until one month after the appearance of the initial symptoms, with oral cavity opening of less than 0.5 cm. The sequestrectomy was followed by nutritional supplementation and administration of massive doses of crystalline penicillin and Gentamycin by intravenous injection for 14 days. The second case is a 10-year-old boy weighing hardly 14 kg with purulent discharge from an oedema appearing at the left mandibular level 15 days after contracting measles. The child was sent to the hospital 40 days later with broncho-pneumonia. Having observed the presence of *Pseudomonas aeruginosa* and *Citrobacter*, intravenous administration of crystalline penicillin, Gentamycin and Metronidazole was prescribed for 14 days, in addition to nutritional supplementation. The two children responded to treatment and were waiting for reconstructive plastic surgery. Adequate feeding, vaccination, early medical care and education for health would help to avoid death and extended tissue loss. But, in the South of India, there are still some socio-cultural obstacles such as the ban on taking the child out of the house during or immediately after measles.

Brady-West DC, Richards L, Thame J, Moosdeen F, Nicholson A. Cancrum oris (noma) in a patient with acute lymphoblastic leukaemia. A complication of chemotherapy induced. The West Indian medical journal 1998; 47(1): 33-4.

Noma is commonly described in debilitated malnourished children with poor oral hygiene, during the regression phase of childhood diseases like measles, whooping cough or scarlet fever. The authors, however, report in 18 this article a case of noma developed under other conditions in Jamaica. The disease occurred during a period of profound neutropenia following cytotoxic chemotherapy for treating acute lymphoblastic leukaemia.

Fu-Tang Chu, Chuan-Fan. Cancrum oris. A clinical study of 100 cases with special reference to prognosis. Chinese Medical Journal 1936; 50: 303-323.

From February 1921 to May 1935, 100 noma patients were admitted to the Union Medical College Hospital in Peiping (China). During the same period, 75 patients in external consultation were also diagnosed as suffering from the same disease. The majority of the patients admitted were under 10 years (n=77) and very few were above 15 years (n=7). The major predisposing diseases were Kala-Azar or visceral leishmaniasis (79 %), measles (4%) and bacillary dysentery (3 %). The mortality rate was 55 % in this series. Of the 46 cases that were in the chronic phase, 89% either died or left the hospital in a moribund state. The study stresses that the prognosis was very poor among children, especially in the case of complications. The disease was fatal in 77 % of cases. The most dangerous complications are broncho-pneumonia and bacillary dysentery, as the outcome is nearly always fatal in these cases. The authors also discuss treatment and prevention of noma.

Griffin J. M., Bach D. E., Nespeca J. A., Marshall K J. Noma: report of two cases. Oral Surgery, Oral Medicine and Oral Pathology 1983; 56(6): 605-607.

The article reports two cases of noma occurring as a result of malnutrition on a septic area, consulting at the Army Medical Centre at Honolulu, Hawaii. The characteristics of the 2 patients, aged 26 months and 3 years respectively, their care and treatment and results obtained are described in the article. None of the two reported back for follow-up and the younger one died 6 months after leaving the hospital.

Jain M., Sarkar N., Lamba P. A. Noma: A case report. Indian Journal of Ophthalmology 1985; 33(4): 249-250.

This article reports the case of a six-month old little girl admitted at the paediatric unit of New Delhi Hospital (India), with chronic diarrhoea, incapacity to gain weight and nasal oedema, followed 24-48 hours later by massive tissue destruction, exposing the underlining lachrymal and nasal bones. Repeated cultures showed that the lesion was sterile. An intensive local treatment, consisting in washing the ulceration with hydrogen peroxide to eliminate the necrotized tissue, an antibiotic therapy and improvement of the general state through dietetic and medical means enabled the child to leave the hospital 4 weeks later.

Jimenez M. L., Baer P. N. Necrotizing ulcerative gingivitis in children: A 9 Year Clinical Study. The Journal of Periodontology 1975; 46 (12): 715-720.

A research was conducted in 1965 in Colombia to describe the different clinical manifestations, etiological factors and find methods for preventing and controlling the disease and its sequelae. Patients included in the study are those consulting at the Dental School Clinic (University of Antioquia) and Medellín Teaching Hospital. It involves 37 children from 2 - 14 years, suffering from necrotizing ulcerative gingivitis (n=28) and noma (n=9). After the clinical diagnosis, bacteriological and microscopic analyses were carried out. At the etiological level: all the patients had poor oral hygiene, came from disadvantaged environments, suffered from nutritional deficiency, especially in vitamin B and proteins. A 10-year-old child also presented herpetic primo-infection. Besides, among those suffering from noma, the appearance of the symptoms was

preceded by measles (n=3), intestinal parasitosis (n=1) and Gaucher's disease (n=1). In the early stage of noma, local incising and systematic antibiotic therapy produced good results. The study shows that prevention should rely on improvement of the nutritional status, education of children and families on the importance of oral hygiene and immunization against infectious diseases like measles. It also helped to draw many conclusions, notably for research purposes.

Kikuchi I, Sakaguchi E. Bacterial gangrene on the cheek of a comatose patient - Necrotizing fasciitis or noma. J Dermatol 1989; 16(3): 251-252.

The authors report the case of a 68-year-old woman in Japan. This comatose patient developed gangrene on her left cheek following a small wound in contact with the gastric tube placed after partial gastrectomy. The patient was diagnosed for necrotizing fasciitis due to *Klebsiella pneumoniae* 24 days after the surgical operation. No autopsy was performed when the patient died 2 days later.

Malden N. An interesting case of adult facial gangrene (from Papua, New Guinea). Oral surgery, oral medicine, and oral pathology 1985; 3: 279-281.

From 1979 to 1981, 3 cases of noma were received in a hospital in Papua New Guinea. Two of the patients were teenagers and the third, an adult. All of them presented clinical characteristics of noma. It is the latter case that the author presents in the article. It is the case of an elderly woman admitted in a severe debilitating state, weighing only 20 kg. Despite 20 the intensive treatment she received, she died 12 days after her admission. Since no autopsy was performed, it was not possible to diagnose the underlying systemic conditions responsible for the deterioration of her general condition.

Oberoi G S, Bithal P K, Saxena N, Kaul H L. Anesthesia in cancrum oris. Indian journal of pediatrics 1985; 52(419): 671-672.

The authors expose the major difficulties of anaesthesia in a patient suffering from noma. As an illustration, they present the case of a 2½-year-old child suffering from noma in New Delhi, India, with several complications, including hepatosplenomegaly with septicemia and respiratory distress.

Pindborg J J, Bhat M, Devanath K R, Narayana H R, Ramachandra S. Occurrence of acute necrotizing gingivitis in South Indian children. Journal of periodontology 1966; 37(1): 14-19.

For more than 100 days, the authors examined 10 000 patients from April to August 1964 at Bangalore Dental College in India to determine the prevalence of acute necrotizing gingivitis. The study helped to diagnose: 232 cases of acute necrotizing gingivitis, 10 cases of acute herpetic gingivo-stomatitis and 4 cases of patients suffering from both diseases at the same time. Only one case of noma was identified during this period: It involved a 1½-year-old boy who was also suffering from acute necrotizing gingivitis.

Ruben M P, Miller M. Noma: its association with nutritional deprivation and physical debilitation. Report of case. Oral surgery, oral medicine, and oral pathology 1964; 18: 167-175.

An unusual case of noma was diagnosed in January 1962 in a 39-year-old woman admitted to Beth Israel Hospital of Boston, U.S.A. The patient was suffering from: gangrenous stomatitis, anaemia and protein deficiency, cirrhosis of the liver, acute alcoholism and genital gonorrhoea infection. Initially, the patient seemed to respond to treatment with aqueous penicillin (1,000,000 units 4 times per day by intramuscular injection), vitamins, nutritional supplementation, and hydrogen peroxide for rinsing every 2 hours. But, after a slight improvement in her state during the first 72 hours, she developed resistance to penicillin. Treatment with tetracycline was then administered for 5 days. After staying in the hospital until the end of February, the patient was followed up externally by the dental and medical units. The authors highlighted the significant contributions of the hospital team in the successful care and treatment of a case of noma on a patient with malnutrition and physical debilitation.

Stassen L F, Batchelor A G, Rennie J S, Moos K F. Cancrum oris in an adult Caucasian female. The British journal of oral & maxillofacial surgery 1989; 27(5): 417-22.

The authors report a case of noma in a 63-year-old Caucasian woman who presented no obvious predisposing factors. This patient, referred September 1985 to Canniesburn Hospital of Glasgow, Scotland perfectly illustrates the difficulties in diagnosing and treating the disease in a region where it is rare.

Valadas G, Leal MJ. Cancrum oris (noma) in children. European journal of paediatric surgery 1998; 8(1): 47-51.

Noma, which mainly affects malnourished and immunosuppressed children, is frequent in developing countries, and, occasionally in patients suffering from AIDS and Leukaemia in America and Europe. In this article, the authors report the case of a 3-year-old African girl admitted to the paediatric surgery unit of Dona Estefania Hospital in Portugal. The patient was in an advanced stage of the disease, with severe sequelae, partial tissue loss, notably on the lips, the right cheek, the right side of the nose and the maxillary. They also discuss the choice of treatment and possible reconstruction.