Research/Recherche

Recurrence and emergence of infectious diseases in Djibouti city

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Public health authorities are now increasingly concerned by changes in the epidemiology of infectious diseases which may have an adverse impact on their budget plans and control strategies. Rapid increases in population and urban migration, various ecological changes, increasing poverty, and a rise in international travel have contributed to the worldwide vulnerability of human populations to the emergence, recurrence or spread of infectious diseases. In the rapidly growing city of Djibouti in East Africa, public health priorities have been altered during the last 10 years by diseases which were unknown or under control until the early 1980s. These diseases, including malaria, AIDS, tuberculosis, dengue fever and cholera, are consuming considerable resources. This article on Djibouti illustrates the epidemiological changes in the region. Besides the specific ecological and behavioural changes, which accompany rapid population growth, poverty seems to be a major cause for the emergence and recurrence of infectious diseases.

Introduction

Recurrence of old infectious diseases and the emergence of new ones, as revealed by unexpected outbreaks or epidemics, are being reported with increasing frequency (*1*) and could have an adverse impact on health care budgets and disease control strategies. The seriousness of the situation has led to the development of a prevention strategy by the Centers for Disease Control and Prevention (CDC), which addresses emerging infectious disease threats to the United States (*2*).

This article describes recent changes in the epidemiology of infectious diseases in the capital city of Djibouti, East Africa, which illustrates the problem of emerging diseases in a rapidly growing city of the developing world. The changes are related to poorly documented but significant population movements, including the influx of refugees, in Djibouti following the Ethiopian and Somali political turmoils since the late 1970s and the periodic regional famines.

Findings and discussion

The population of Djibouti city was about 15 000 in 1900, 30 000 in 1950, 106 000 in 1970, 156 000 in 1980, 235 000 in 1990, and about 300 000 in 1994 (de Comarmont, Ministry of Urbanism, Djibouti, personal communication, 1994). This increase was primarily due to economic immigrants, high birth rates and the refugees. Although about a third of the national budget has been spent on development since 1977 (de Comarmont, personal communication), the living conditions of Djiboutians remain poor. In an interview to the national newspaper "La Nation" on 7 October 1993, the Djibouti Minister of Urbanism depicted significant difficulties in water supply, sewage system, garbage collection and general housing, and further emphasized the possible adverse consequences on public health. The chronology of the emergence of malaria, HIV/AIDS, multidrug-resistant tuberculosis, dengue fever and cholera in the city of Djibouti is presented in Fig. 1 with the changes in population growth.

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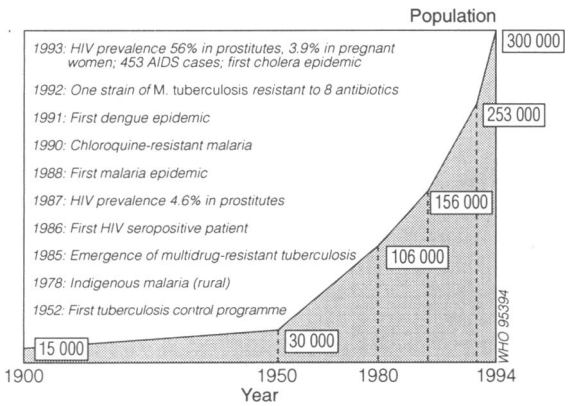
Fig. 1. **Population increase of Djibouti city and chronology of local epidemiological changes involving infectious diseases, 1900–1994.**



Malaria

In the early 1900s, only two malaria foci were identified, one in Ambouli and the other in Gaanman, two villages located within 4 km of Djibouti city, along the main river valley or wadi (*3*). Subsequently malaria cases, mostly imported from neighbouring countries, were only infrequently reported until 1973 (*4*). Recurrence of indigenous malaria was first documented in 1978 in the southern districts, especially Ambouli and Loyada, and then Dikhil and Ali-Sabieh. Malaria, initially unstable with peaks in May–June and November–December, soon became endemic throughout the year, including the dry and torrid summer period. In the following years, cases of malaria occurred for the first time in the northern districts, particularly in Tadjourah. During the 1988–89 winter season, outbreaks of *Plasmodium falciparum* malaria struck the country, including the capital city and the south-western town of As-Eyla (*5*). About 3000 malaria cases with significant mortality were reported and the importation of malaria parasites by travellers from adjacent countries was suspected (*6*). *Anopheles arabiensis* was identified as the main vector (*7*). In 1991, Djibouti reported 7338 cases of smear-positive malaria, 98% being falciparum malaria and 80% originating from the Ambouli and airport areas of Djibouti city. Although the figure dropped in 1993 to 4770 (74% from the capital city), malaria had become a permanent public health concern in Djibouti city where the marked seasonal pattern had decreased considerably compared to rural areas. The emergence of urban malaria closely followed the progressive inclusion of the wadi Ambouli, known for its gardens and wells, in the growing agglomeration of Djibouti. Entomological surveys confirmed the Ambouli area as a major source of *Anopheles* mosquitos (*8*). In addition, and following the 1985 report of chloroquine-resistant *P. falciparum* in Ethiopia (*9*), *P. falciparum* strains resistant to chloroquine *in vivo*, including RII/RIII resistance, was demonstrated in Djibouti in 1990 (NAMRU-3, unpublished data).

HIV/AIDS

The human immunodeficiency virus (HIV) was unknown in the Republic of Djibouti until the diagnosis of the first HIV-1 seropositive patient in the spring of 1986. In October 1987, the first national serosurvey showed that HIV-1 was prevalent among 0.8% of males consulting for sexually transmitted diseases (STD), 1.4% of bar hostesses and 4.6% of street prostitutes. Only one serum had antibodies against HIV-2. In March 1988, the first case of acquired immunodeficiency syndrome (AIDS) was diagnosed in a tuberculosis (TB) patient who died 3 weeks later. In June 1988, a second cross-sectional survey (*10*) showed a low and stable HIV prevalence among male STD patients while the figure rose to 2.7% in bar hostesses and 9% in street prostitutes. In February 1990, HIV prevalence was 41.7% in street prostitutes, 5% in bar hostesses and 1.9% in STD males (*11*), while the school population remained HIV-free (*12*). In 1990 the Republic of Djibouti distributed more than 300 000 free condoms and, in December, reported 58 AIDS cases to WHO (*13*). In 1993, HIV infection was prevalent in 56.5% of street prostitutes, 23.3% of bar hostesses and 14.4% of men consulting for STD (Djibouti MOH, personal communication, 1994). At that time, HIV prevalence in pregnant women had reached 3.9% versus 1.5% in 1992 and 0.5% in 1991; in 1993, the prevalence was 7.4% in TB patients (*14*) and 1.2% in blood donors (Djibouti MOH, personal communication, 1994). The cumulative numbers of AIDS patients officially reported since 1988 reached 104 in December 1991 (*15*), 309 in December 1992 (*16*), and 453 in December 1993 (*17*).

Tuberculosis

In 1952, the first national tuberculosis (TB) control programme was launched in Djibouti. The national tuberculosis hospital, built in 1967 in Djibouti city, with an initial capacity of 100 beds was extended to 178 beds in 1974 and 210 in 1987 (*18*). From 1986 to 1989, the number of newly diagnosed tuberculosis patients in Djibouti was stable around 2000 cases. This figure included a significant percentage of foreigners, primarily Ethiopians and Somali. Since 1989, newly diagnosed tuberculosis cases, in both Djiboutians and foreigners, have increased to a total

of 3700 in 1992, representing, for the Djiboutians alone, a twofold increase in a four-year period. In 1992, the estimated tuberculosis incidence in Djiboutians was 280/100 000. The combination of the rapid population growth, the concurrent HIV/AIDS epidemic, and the deterioration of therapy compliance were certainly key factors for the new tuberculosis burden. In March 1992, an isolate of *Mycobacterium tuberculosis*, resistant to 8 antibiotics was reported. A retrospective study of antibiotic sensitivity screenings demonstrated the growing importance of multidrug-resistant tuberculosis, which was emerging in 1985 and has been significant since 1989 (*19*). The frequency of strains sensitive to all frontline drugs (i.e., isoniazid, pyrazinamide, ethambutol and rifampicin) decreased from 55.5% in 1988 to 16.7% in 1992. Because of the unknown actual importance of primary resistance, surveillance of primary resistance has become a new objective for the Djibouti tuberculosis control programme. The cost of this programme (*18*) will continue to increase because of the necessary investment for better compliance with treatment, increased laboratory activity, and the use of more expensive drugs. Finally, the growing burden of prolonged hospitalization of AIDS/tuberculosis patients will soon consume a significant share of the available resources.

Dengue

In October 1991, an outbreak of acute fever with negative blood smear for malaria was reported in Djibouti city. It involved hundreds of residents, adults and children, locals and foreigners. Reported symptoms included high and acute fever associated with severe headache, fatigue, arthralgia and myalgia. Rash, pruritus, conjunctivitis, abdominal pain, vomiting and epistaxis were also described. Fever lasted for 4–6 days before spontaneous recovery occurred. Leucopenia, thrombocytopenia and slightly elevated liver enzymes were common. Few patients were hospitalized, with the exception of a suspected case involving a 27-year-old Djiboutian woman who died of shock syndrome and intestinal haemorrhage in the first few days of the epidemic. Aside from this case, no severe haemorrhagic disease was described. The investigation yielded 13% virus isolates of dengue serotype 2 (DEN-2). Cases occurred until February 1992 and the estimated total number was 12 000 (*20*). A retrospective serologic study and a 1987 serosurvey (*21*) showed little or no flavivirus activity, supporting the conclusion that DEN-2 virus had recently been introduced. Although dengue transmission had been suspected in neighbouring Somalia and Ethiopia (*22*), this was the first epidemic reported from Djibouti. In 1983, serologically suspected cases of dengue, serotype 2, occurred in expatriates in Mogadishu, Somalia (*23*), and later, during the 1985–87 period, in the Dam refugee camp near Hargeysa, northern Somalia (*24*). The presence of *Aedes aegypti* was not previously reported in Djibouti (*25*), but an entomological survey, conducted in 1992, demonstrated that this species was widespread, abundant and well established in many parts of the city. The predominant larval habitats were 200-litre metal barrels and clay water jars (*26*). Secondary breeding sites included discarded plastic water bottles and foil-lined milk containers. The spread of *A. aegypti* had previously been documented in the region, particularly in the coastal cities (*25*). During the 1993–94 winter, a limited outbreak of serologically suspected dengue fever occurred in Djibouti city (Djibouti MOH, personal communication, 1994).

Cholera

Cholera has been repeatedly introduced into the region and the seventh cholera pandemic, caused by *Vibrio cholerae* El Tor, reached the Horn of Africa in 1970, and led to several thousand deaths, particularly in Ethiopia; cholera has since been endemic in the region (*27*). Djibouti's rural areas had limited cholera outbreaks in 1973 and 1985. During summer 1992, cases of cholera were reported among Somali refugees in Yemen (*28*), but no recrudescence of the disease was observed in Djibouti until 13 July 1993, when the first case of cholera was clinically suspected in the Salines area, one of the poorest quarters of Djibouti city. A control programme was immediately set up, including the inspection and chlorination of all fresh water sources and the establishment of two diarrhoea field hospitals. By 8 August 1993, more than 2000 cases of acute diarrhoeal disease were reported in the capital. About 32% of examined stool samples yielded *V. cholerae* O1, all of the El Tor biotype, serotype Ogawa, sensitive to most of the antibiotics (NAMRU-3, unpublished data). In late July, water analysis in Djibouti city isolated 4 strains of *V. cholerae* O1, three from water tanks and one from a well (Djibouti MOH, personal communication, 1993). The epidemic peaked in early August, then was under control by the end of the month and died out in late September; a total of more than 5000 acute diarrhoeal cases were reported. In August, the epidemic also spread to the rural cities of Ali-Sabieh, Dikhil, Arta and Tadjourah and to some refugee camps on the Ethiopian border. Because of the rapid (and free) access of Djibouti residents to the two large rehydration centres, only 32 deaths were recorded among the 1428 hospitalized diarrhoeal patients; the global attack rate of suspected cholera in the capital city was 12.2 per 1000 (Djibouti MOH, personal communication, 1993).

Additional changes have been observed since 1990, including the recent recognition of hantavirus in the *Rattus norvegicus* population of the port area (*29*) and the emergence of multidrug-resistant strains of *Neisseria gonorrhoeae* (Djibouti MOH, personal communication, 1994) and *Shigella* spp. (*30*). Although similar epidemiological changes have been suspected or reported in various places of neighbouring Ethiopia (*9*) and Somalia (*22*), the city of Djibouti was ideal for studying the documented epidemiological changes within a limited area. Despite some relatively weak data, the trends are clearly present. These epidemiological changes were due to ecological and behavioural changes including poverty and rapid urbanization. Specific changes and their causes included urban encroachment into a malaria endemic rural area, emergence of multidrug-resistant *M. tuberculosis* from lack of compliance with antituberculous treatment, introduction of HIV infection and AIDS through prostitution, the absence of an appropriate water supply, the spread of *A. aegypti* leading to the dengue epidemic, and the influx of refugees into areas of poor sanitation which led to the cholera outbreak. As emphasized in WHO's *World Health Report 1995*, poverty "conspires with the most deadly and painful diseases to bring a wretched existence to all who suffer from it", and seems to be a major factor in the emergence and recurrence of infectious diseases.

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Résumé

Réapparition et émergence de maladies infectieuses en ville de Djibouti

La réapparition et l'émergence de nouvelles maladies infectieuses, révélées par des épidémies telles que la pandémie de SIDA ou la fréquence croissante de souches bactériennes résistantes aux antibiotiques, sont devenues un sujet de préoccupation pour la santé publique, y compris dans les pays développés. L'explosion démographique, les migrations urbaines massives, les changements apportés à différents écosystèmes, la pauvreté croissante et l'augmentation spectaculaire des voyages internationaux ont sans aucun doute contribué à la vulnérabilité des populations vis-à-vis de l'émergence, de la réapparition et de la diffusion mondiale de certaines maladies infectieuses. Dans la capitale de la République de Djibouti, les problèmes de santé publique ont été profondément modifiés durant ces 10 dernières années tandis que la ville s'étendait considérablement. Cinq maladies, inconnues ou maîtrisées jusqu'au début des années 80, jouent maintenant un rôle de premier plan dans les causes de morbidité et de mortalité chez l'enfant et l'adulte. Ainsi, la lutte contre le paludisme, le SIDA, la tuberculose, la dengue et le choléra ont mobilisé des ressources considérables. Les données sur la ville de Djibouti illustrent concrètement les changements épidémiologiques rencontrés dans les zones urbaines de la région. En dépit de certains changements spécifiques sur le plan écologique, tels que l'intégration dans le tissu urbain d'une zone rurale endémique pour le paludisme, ou sur le plan des comportements (prostitution, stockage de l'eau à domicile) qui peuvent expliquer certains des changements épidémiologiques observés, la pauvreté semble bien être le principal acteur du retour, ou de l'émergence, de ces maladies infectieuses.

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