
**Hospital Waste and Typhoid Fever, a Public Health Problem in Hospitals:
Treatment and Comparison of the Activity of Gatifloxacin, Cefixim and
Chloramphenicol in Kinshasa (Drcongo).**

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Abstract

The present study aims to compare the activity of three oral antibiotics (gatifloxacin, cefixime and chloramphenicol) in nurses in three hospitals in Kinshasa, DRC (HGPRK, HGRN and HGK). The management of hospital waste solid or not does not follow the standards issued by the WHO (garbage are not up to standard, the staff has no protective equipment .).

Staff infected with salmonella typhus is nurses, paramedics, workers who are in the forefront in the collection, packaging and treatment of solid biomedical waste. Having been treated with the three antibiotics, the activity of gatifloxacin shows a cure of 94.74% and makes disappear completely the symptoms on the nurses followed. This activity is higher than that of cefixime for 63.15% and chloramphenicol for 52.63%.

It is useful to recommend gatifloxacin followed by cefixime in developing countries.

Keywords: Hospital waste, Typhoid Fever, Nurses, Activity, Gatifloxacin, Cefixime, Chloramphenicol, Hospital, Kinshasa, DR Congo.

Introduction

In the configuration of the hospitals visited in Kinshasa, capital of the Democratic Republic of Congo, hospital waste is a real public health problem. They consist of waste assimilated to household waste (DAOM) and waste activities of infectious risk care (DASRI). They are then solid biomedical waste generated by a hospital structure (kitchen waste, office departments as pediatrics, gynecology, surgery,) (Daumal, 2012). Thus, the cited author summarizes hospital waste as any biological or non-biological waste, disposed of without any intention to be reused.

The hospital staff who is exposed and who makes the connection between the patient and the doctor is the nurse (diploma, passionate, vigilant and of a good human quality (Marie-Céline, 2017).

A nurse is a person because of his profession is close to patients and acts according to the advice of doctors. It ensures the comfort of the patient, their hygiene and their well being. His place of work is the hospital, clinic or other liberal health structures. Thus, it is exposed to several associated infections (mismanagement of patients and their waste in a health facility) such as nosocomial disease and its corollaries such as pneumonia, urinary tract infections, sepsis, digestive tract infections and typhoid fever (Daschner, 1993).

Typhoid fever is a bacterial infection that causes sepsis related to an infectious agent. The infection can be serious and even deadly because of the so-called Salmonella typhi bacteria. It can be passed on to health professionals through human waste or the biomedical waste that contains them. Its transmission is then direct human through dirty hands and / or indirect by water or food soiled with contaminated material (Weill, 2010). Salmonella Typhi can persist asymptotically in the gastrointestinal tract from the gallbladder and rarely in the urinary tract (Roumagnac P. & al, 2006). The germ is found in the blood by performing blood culture (Bhutta, 2006).

Data from the World Health Organization in 2018 show that 11 to 20 million people contract the disease and that 128,000 to 161,000 die annually (WHO, 2018). The symptoms are: prolonged fever with temperatures between 39 and 40 ° C, headache, nausea, abdominal pain, constipation and / or severe diarrhea that appears when the disease worsens, rashes (hot spots) for some patients. There are other symptoms that occur in patients such as abdominal pain, restlessness, confusion, chills, attention disorders, nosebleeds, severe fatigue, lethargy, weakness ... The introduction of antibiotic therapy such as chloramphenicol in 1948 was a step forward, but by the 1980s multi-resistant strains of amino penicillin's and cotrimoxazole appeared (Weill, 2010). That's why it was useful to try other antibiotics to better fight typhoid fever raging on 20 million people in Asia, Africa and other countries in the world (www.sciencesetavenir.fr).

The treatment involves the administration of liquid and intravenous electrolyte to kill the bacteria. Antibiotics also have the same role. Examples of typhoid medicines are chloramphenicol, ciprofloxacin, cefotaxim, ofloxacin, azithromycin, trimethoprim. The list is not exhaustive but you should know that the family of fluoroquinolone is interesting for the fight against *Salmonella typhi*.

Poorly sorted, hospital waste carries several diseases (bacteria, germs, etc.), especially in the first line are the nurses who collect waste in their department or department.

The objective of our study is to verify if the nurses of the health facilities visited are affected by typhoid fever in the exercise of their function when they are in the presence or handling of hospital waste. If warranted, our team will assist with the use of an antibiotic treatment - gatifloxacin 200mg or 8-methoxyfluoroquinolone - of the formula $C_{19}H_{22}FN_3O_4$ (under the trade name Zymaxid), cefixim of the chemical formula $C_{16}H_{15}N_5O_7S_2$ and chloramphenicol of the chemical formula $C_{11}H_{12}Cl_2N_2O_5$.

This dose is recommended as a tablet to take by mouth. The choice of gatifloxacin is dictated by the fact that it can cure patients in 96.5% of cases (Sulochana, 2005). On the other hand, for cefixime, healing is obtained for 60 to 65% of cases and for chloramphenicol, around 60% (Boumghar L. & al, 2008) (Keddy & al, 2010) (Meyruey et al, 1975).

What motivates this study is the fact that in May 2004, the WHO launched an alert that shows an epidemic outbreak of typhoid fever in Kinshasa in the localities of Kimbaseke, Kikimi, Masina, Ndjili. 13400 cases were reported including 615 serious cases counted who suffer from peritonitis for 134 fatal cases for 10 days (1 to 10/12/2004). Out of 200 observations, one study indicates that 0.5% of typhoid fever cases have been reported by medical personnel (Valmary, 1979).

Methodology and material.

The target population is nurses from four health facilities in Kinshasa Province, DR Congo. These hospitals are old and partially funded by the state under the supervision of the Ministry of Health. Health facilities are composed of:

The Kinshasa Provincial Reference General Hospital (HGPRK): was created in 1912 with a capacity of 2,000 beds with 1004 beds occupied to date. There are 31 pavilions with several departments ranging from pediatrics to physical medicine. There are 2368 employees, including 1050 paramedics, 69 maintenance workers, 169 doctors and other non-inventoried agents.

The General Reference Hospital of Ndjili (HGRN): was created in 1952 for 22 services for 260 occupied beds. 405 agents make up the entire staff of the hospital. It is composed of 90 doctors, 130 paramedics, 150 administrative agents and 35 maintenance agents.

Kin ambo General Hospital (HGK): was established in 1923-1924; with currently several departments for 230 occupied beds. 804 staff makes up the entire hospital staff of 222 doctors, 259 nurses, 232 administrative staff, 86 paramedics and 5 maintenance staff.

Our sample selection is for male to female nurses aged 30 to 45 who have been working in this job for at least 10 years and who completed the questionnaires for a period of 4 months. Before submitting questionnaires to nurses, here are the pictures that summarize how hospital waste is managed.

The two figures (I and II) which follow show on the left a nurse - laboratory assistant who takes the blood of a patient without any protection. The syringes, the cotton wool are thrown on this blue cover where we find paper, bottles, with drops of blood scattered on the lid. The nurse is exposed here to any kind of disease and microbe (bacterium, germ that accompanies the waste.



Figures (I, II): Laboratory sampling of HGPRK

Then the waste is stored by the nurses in their service and the cleaning agents come to recover for a final evacuation place which is often chosen at their choice in the periphery or inside the health facility as the show Figures III and IV. The hygienist nurse without any protection comes to supervise the incineration of placentas and other waste coming from red bin in a locally manufactured apparatus. Air pollution by smoke is not to be avoided.



Figures (III, IV): bin with mixed hospital waste in the HGRN gynecology ward with a red placenta pocket and right a local incinerator on the outskirts of HGK.

The figures above illustrate the behavior of nurses in the study hospitals.

Thus, a follow-up for one year from January 2017 to December 2017 is necessary to see the manifestation of signs of typhoid fever (prolonged fevers around 39 to 40 ° C, continued headache, cough and regularity of diarrhea, nausea and abdominal pain). For the selected case, they continued the care in January and March 2018 using the chosen antibiotic.

To confirm the presence of *Salmonella* in adults, blood culture was performed. The samples taken by the nurses have not been made by intravascular a device, which often increases the risk of contamination. The contaminations are linked to the fact that the sampling site is poorly prepared, hands that are not disinfected, poor sampling techniques with invasive devices and poor asepsis of caps of blood culture flasks. The facts also that the nurses do not wear gloves increase the chances of contamination.

As equipment: an automaton for incubation for a period of 5 to 7 days, tourniquet, hydro-alcoholic solution, disinfected bottles. The quantity of blood sampled is at least 20 ml distributed in two vials of aerobic and anaerobic blood culture (it is possible also two or three or four pairs of blood cultures collected over 24 hours). The total volume cultured varies between 40 and 60 ml (Lee, 2007). It should be noted that before any antibiotic treatment, three pairs of blood cultures must be taken, where the incubation period will be prolonged from 5 to 7 days to 21 days minimum.

Results and discussions.

During a period of 12 months from January 2017 to December of the same year, the behavior of the nurses was followed: the presence of high fever (about 40°C), regular headache, vertigo,

insomnia, repetition, bleeding from the nose, nausea, anorexia, cough, diarrhea ... At the age of 30 to 45 years, 40 of its nurses suffer from typhoid fever and the agent identified is salmonella typhus or bacillus Eberth (Leroy, 2015). 38 nurses by hospital structure accepted care with antibiotics (chloramphenicol 250mg, Caffeine 200mg and gatifloxacin 200mg both of the class of quinolones.

The symptoms followed are: fever, headache, cough and diarrhea. The results are recorded in the following tables:

Table I. Treatment of nurses with gatifloxacin (n=38) (HGPRK)

Days	Tablets	Resultats	%	comment
1	2	2/38	5.26	Dropping
3	6	36/38	94.74	Healing : no signs

Table II. Treatment of nurses with Cefixime (n=38) (HGRN)

Days	Tablets	Resultats	%	Comment
1	4	14/38	36.85	Remaining symptoms
3	6	24/38	63.15	Healing : no signs

Table II also shows that cefixime cures typhoid fever within 3 days after taking 6 capsules and all symptoms disappear. Of 14 cases or 36.85%, there are still symptoms related to acute headaches. Treatment continues without study.

Table III. Treatment of nurses Traitement with the chloramphenicol (n=38) (HGK)

Days	Tablets (250mg)	Resultats	%	Comments
1	4	8/38	21.05	Remaining symptoms + abandon
5	16	10/38	26.32	Decrease in symptoms
10	20	20/38	52.63	Healing : no signs

21% or 8 cases dropped the drug during the study and we also assume that the symptoms remain. On the other hand, 52.63% were cured or 20 cases and others 26.32% saw the decrease in symptoms especially the disappearance of fever and headache. The diarrhea still persists. Follow-up is done outside of study.

Chloramphenicol cured only 52.63% of cases compared to 26.32% who saw the decrease in symptoms and remain followed, 21.05% gave up for a reason that cannot be justified.

Nurses lower the body temperature, by self-medication with quinine (or aspirin) whenever it had the episode of temperature rise; Dafalgan for headache and Motile for diarrhea. For lack of financial means, other nurses resort to medicinal plants to relieve this rise in temperature.

Comparing the three tables (I, II, III), the most effective antibiotic is gatifloxacin, which shows that 94.74% of nurses have been cured and all signs of typhoid have disappeared in less than 7 days taking 2 tablets a day for 3 days or for 6 tablets). Cefixime, on the other hand, shows that 63.75% of nurses no longer had symptoms of typhoid and they are totally cured while 36.85% of nurses still have clinical signs of *Salmonella typhi*. Finally, chloramphenicol was only 52.63% satisfactory. The nurses were totally cured after 10 days for taking 2 tablets a day, that is 20 tablets. The time taken to take medication seems to be long so we saw dropouts 21.05% and 26.32% which saw only a decrease of the symptoms of the typhoid fever which we estimate that it is necessary to other complementary clinical examinations.

We believe that for all cases of persistence of symptoms, there are public and household insalubrities (presence of mosquitoes everywhere due to lack of environmental sanitation) and the fact that the water used is not drinking. Also, some of them also wash their hands after the service as they work without protection like proper gloves, glasses, blouses. Figures V and VI illustrate our remarks.



Figures V (left) and VI (right) show the advanced state of insalubrities' where dwellings are exceeded by a public dump. The tap of drinking water is drowned in a pile of trash. This dump is a mixture of solid household and hospital waste. Just search the public dump to find syringes, tourniquets, and placenta. It is also a place where mosquitoes, rats ... proliferate, which do not cause temperature rises or fever.

Conclusions.

The study answers the question to the main question. Indeed the comparison of three antibiotics shows that there is way to use the family of flouroquinolones than that of pencils. The results that use gatifloxacin for 94.74% of nurses healed are interesting followed by those of Cefixime which shows 63.15% of nurses healed. With regard to chloramphenicol the results are not interesting. We advise you to help eradicate typhoid with Zymaxid 200mg. This result confirms the WHO study on the application of gatifloxacin in 390 patients in Asia and South Africa, which was

found to cure 96.5% compared with 62.4% for cefixime used in several health services of Nepal (Kasuku and al, 2018) (www.sciencesetavenir.fr).

For nurses who are not cured by antibiotics, we propose the use of vaccines as proposed by the World Health Organization (WHO,2008)

With education and public awareness of hospital hygiene in health facilities where many bacteria and germs circulate, this disease can be eradicated.

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