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# Corneal Blindness Caused by Accidental Ocular Use of Chlorhexidine (Hexz) Gel in Two Newborn Born in the Health District of Kati in Mali

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## Abstract

**Introduction:** Corneal opacities in children are relatively common. In children, it is urgent because of the risk of irreversible amblyopia. The causes of these blindnesses vary considerably according to the regions of the world. Chlorhexidine digluconate is a broad-spectrum antiseptic directed against gram-positive and gram-negative bacteria. It has been used as an antiseptic for more than 50 years, both in humans and in animals. However, despite these benefits, it can cause serious damage if applied to the eyes. Incidents of eye damage with 7.1% chlorhexidine have been reported to WHO across Africa. **Observation:** We report and write two cases of bilateral corneal blindness caused by accidental ocular use of chlorhexidine (HEXZ) GEL 7.1% in two newborns in the health district of Kati in MALI. The ophthalmological examination had revealed corneal opacity, conjunctival hyperaemia and limbic ischemia greater than 50% in 1 eye out of 4, corresponding to stage IV of the ROPPER HALL classification; 2 eyes out of 4 were at stage III and 1 eye out of 4 was at stage I of the same classification. **Conclusion:** It is essential to ensure correct use of chlorhexidine digluconate gel 7%. It is an antiseptic which should not be used on the ocular and auditory mucous membranes, at the risk of most often permanent burns.

## Keywords

Chlorhexidine, Opacity, Cornea, Kati

## 1. Introduction

The World Health Organization (WHO) uses the International Classification of Diseases (ICD) to define the different levels of visual impairment. According to this classification, it defines two levels of visual impairment: blindness and low vision [1]. Indeed, we speak of blindness from a corrected visual acuity of less than 1/20$^{th}$ (3/60) or a narrowing of the visual field of less than 10˚ for the better eye, and low vision from a corrected visual acuity of less than 3/10$^{th}$ and greater than or equal to 1/20$^{th}$ for the better eye [2].

Blindness is a public health problem in the world and especially in countries with limited resources in general where its prevalence is on average ten times higher than that of developed countries [3].

That of child prevalence varies considerably around the world. According to 2010 data from the World Health Organization, it was around 0.3% in developed and former Eastern European countries and 1.4% in African countries sub-Saharan. Worldwide, it is estimated at 5%, which would represent approximately 1.4 million blind children [4] [5] [6]. It is estimated that approximately five hundred thousand new cases of child blindness occur each year. This is an urgent problem, which must or should be a priority because of the years of living with visual impairment [2] [6].

The causes of childhood blindness vary widely across regions of the world; in developed countries, it is essentially hereditary or perinatal causes with retinal pathologies as the first etiology, on the other hand in low-income countries, corneal opacities predominate [2].

Corneal opacities in children are relatively common. In children, it is urgent because of the risk of irreversible amblyopia. The etiologies are multiple: acquired or congenital, traumatic, and the severity is variable.

In industrialized countries, corneal disease is responsible for less than 2% of blindness in children, while in poorer parts of Africa and Asia, corneal scarring accounts for 25% - 50% [7].

In Mali, according to Guirou *et al.* [8], in a study on the causes of blindness in children at a school for the blind in Mali, it is reported that damage to the eyeball and cornea constituted 45.2% of the causes of blindness, among which 26% were attributable to corneal damage related to the sequelae of measles and other avitaminosis while damage to the entire globe represented 19.2% and was secondary to anophthalmia, microphthalmia and other globe phthyses.

Thus, we report and write two cases of bilateral corneal blindness caused by accidental ocular use of chlorhexidine (HEXZ) GEL 7.1% in two newborns in the health district of Kati in MALI.

## 2. Case 1

A 10-day-old male newborn was referred to us for visual disturbance by the parents following the use of a pharmaceutical product in gel form, more than 7 days after the incident.

The ophthalmological examination after instillation of a drop of local anesthetic, allowed us to find the edema of the two upper and lower eyelids making it difficult to open the eyes.

The placement of a blepharostat under topical anesthetic, allowed us to highlight in the right eye, significant hyperemia and conjunctival chemosis, a cloudy cornea making it difficult to visualize the other elements corresponding to grade III of the Hughes classification modified by Roper Hall (**Table 1**) [9] [10] [11]. In the left eye (**Figure 1**), significant conjunctival hyperaemia associated with limbic ischemia greater than 50%, an opaque cornea no longer allowing visualization of the iris and other elements of the anterior chamber, corresponding to grade IV of the classification of Hughes modified by Roper Hall.

Faced with this case, for the identification and nature of the pharmaceutical product in question, an investigation was carried out in the field, which allowed us to know that it was chlorhexidine (HEXZ) GEL 7.1%. The product was given to the dad, the day after the delivery by the manager of the pharmacy depot

**Table 1.** Classification of Hughes modified by Roper Hall [9] [10] [11].

| STADIUM | PROGNOSIS | CORNEAL INJURY | LIMBIC ISCHEMIA (% limbal circumference) |
|---|---|---|---|
| I | Excellent | Epithelial damage, absence of corneal opacity | 0 |
| II | Good | Cornea edematous, but iris visible | Less than 33% |
| III | Reserve | Total loss of corneal epithelium, stromal edema impeding visibility of iris details | 33% - 50% |
| IV | Bad | Opaque cornea, iris and pupil not visible | Greater than 50% |

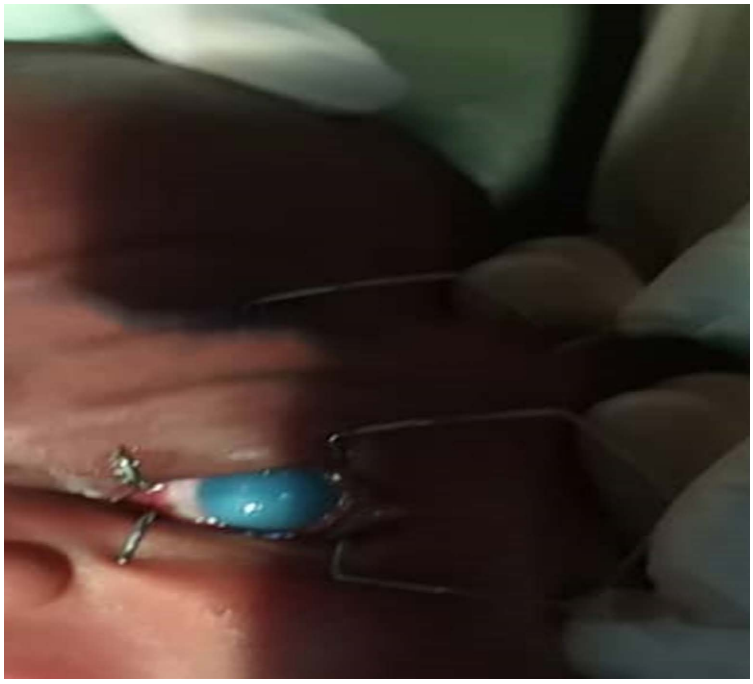

**Figure 1.** (Case1): left eye.

without explanation, following a shortage of stock at the maternity ward with the agent who performed the delivery.

## 3. Case 2

A second 2-week-old male newborn was sent to us in the same context. We proceeded as in the first observation to an ophthalmological examination after instillation of a drop of local anesthetic, which enabled us to find on inspection edemas of the two upper and lower eyelids making it difficult to open the eyes.

The placement of a blepharostat under topical anesthetic allowed us to highlight, in the right eye (**Figure 2**), significant hyperaemia and conjunctival chemosis associated with limbic ischemia of less than 50%, a disorder of the cornea making difficult to visualize the other elements corresponding to grade III of the Hughes classification modified by Roper.

In the left eye (**Figure 3**), significant conjunctival hyperaemia, a slightly cloudy cornea, makes it possible to visualize the iris corresponding to grade I of the Hughes classification modified by Roper Hall.

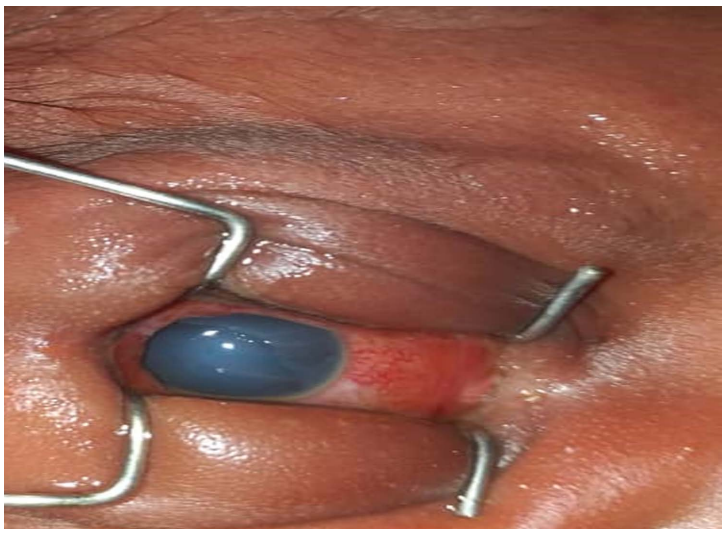

**Figure 2.** (Case 2): Right eye.

**Figure 3.** (Case 2): Left eye.

As part of the search for the identification and nature of the pharmaceutical product in question, it appears that it was always chlorhexidine (HEXZ) GEL 7.1%. The product was given to the mother by the nurse without explanation of the mode of use, nor application of the first dose by the nurse.

As soon as we received the two cases, we proceeded to wash the eyes with saline in both patients.

The medical management consisted of the administration of: the combination of Dexamethasone and Neomycin eye drops, 1 drop every hour for 3 days; then replaced by Rifamycin eye drops, 1 drop every 4 hours; Tropicamide eye drops, 1 drop twice a day and vitamin A eye ointment, 1 application twice a day.

This management led to a reduction in functional inflammatory signs but without a noticeable effect on corneal opacification in 3 out of 4 eyes. This is probably linked to the duration of contact of the product with the ocular surface, which was around 7 days.

On the other hand, in the left eye of Case 2, there was a clear improvement with a small corneal scarring after-effect.

We continue to monitor these two children for psychological and sequelae management with a view to their socio-educational reintegration.

## 4. Discussions

Chlorhexidine digluconate is a broad-spectrum antiseptic directed against gram-positive and gram-negative bacteria [12].

In 2013, the World Health Organization (WHO) included 7.1% chlorhexidine digluconate (which releases 4% chlorhexidine) for umbilical cord care in its Model List of Essential Medicines for Children. given the proven efficacy of chlorhexidine in reducing neonatal mortality at the community level and in primary care facilities in developing countries [13] [14] [15]. Chlorhexidine has been used as an antiseptic for over 50 years, both in humans and in animals.

However, despite these benefits, it is essential to ensure proper use of this product. Because 7.1% chlorhexidine digluconate for umbilical cord care can cause serious damage if applied to the eyes as an eye burn. Our two cases confirm this fact.

Eye burns are an ophthalmological emergency. These eye burns represent 7.7 to 18% of eye injuries [1] [2] [3] [4] [16] [17] [18] [19] [20]. These are most often work, domestic or leisure accidents and assaults [11] [20]. The visual prognosis depends on several factors, namely: the nature of the pathogenic agent, duration of exposure to the pathogenic agents, the nature and rapidity of the initial treatment.

Our two cases were similar to chemical eye burns bychlorhexidine 7.1%. They both consulted, a week or more after the incident. This gave the product a fairly long contact time with the ocular tissues. This would be responsible for the poor or reserved prognosis of this burn, thus giving stage III and IV of the Roper Hall classification at the level of 3 out of 4 eyes.

Similar incidents with the same products, namely chlorhexidine 7.1% for umbilical use, have been reported almost everywhere in Africa by the WHO.

In 2015, there were reports in Nigeria of at least 5 cases where the product was mistakenly applied to the eyes, resulting in eye damage according to the Global Chlorhexidine Working Group (CWG) [21] [22].

In 2019,WHO has been notified of more than 45 cases of eye damage, including cases of blindness, associated with the inappropriate use of 7.1% chlorhexidine digluconate in nine African countries: Nigeria (2015), Senegal (2015), DRC (2015), Liberia (2015), Niger (2017), Mali (2018), Kenya (2018), Chad (2018) and Cameroon (2019) [22]. Reported lesions are associated with both formulations of HEXZ liquid and gel [22].

These two cases testify to the dysfunction of the circuit of supply and delivery of pharmaceutical products in our health structures.

It appears that the instructions and directives given to health workers on the use of the product were not respected. These two cases were cases of avoidable blindness if the health worker had given the necessary information or explanations to the parents of these two newborns on the method of use of the product as well as the precautions to be taken, which is confirmed by Dandona. R *et al.*, in a study, on the assessment, distribution and causes of corneal blindness in a population of South India, stating that nearly 95% of all reported corneal blindness was preventable [23].

Ocular burns are ocular trauma with poor anatomical and functional prognosis in the absence of early and appropriate treatment. These are diagnostic and therapeutic ophthalmological emergencies [24] [25]. In children under 12, it is more of a visual emergency, because of the risk of unilateral amblyopia [24] [25].

This care will initially consist of an emergency eye wash (with saline), the earliness and quality of which will determine the prognosis of the burn [25]. Its severity would be proportional to the delay in the initial treatment, especially for base burns [26]. In our case, it was an acid solution whose pH was between 5.5 and 7, with a very broad exposure time of around 7 days.

The management of serious sequelae such as opacities remains difficult in our case, it most often requires penetrating keratoplasty or keratoprosthesis in cases where visual function is still possible [16].

In our countries, technical platforms and human resources for the realization of these techniques are still non-existent or insufficient. Thus, an effort must be put on the prevention or a rapid and appropriate management of these incidents.

## 5. Conclusions

Chlorhexidine digluconate gel is an antiseptic which should not be used on the ocular and auditory mucous membranes, at the risk of most often permanent burn lesions. The very hard consequences to bear by the child, the family as well as the whole community can constitute a public health problem if nothing is

done.

It is important that healthcare personnel, managers and distributors of pharmaceutical products ensure that instructions for proper use of the product, such as the chlorhexidine 7.1% or other products, are provided to patients, parents and carers according to good medical practice and according to WHO guidelines.

The management of these corneal lesions often requires corneal transplants which are not always available in our countries. Emphasis should be placed on prevention, based on strict observance of its mode of use by healthcare personnel and the community.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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