PORTUGUESE JOURNAL OF PEDIATRICS

PERMANYER

Check for updates

ORIGINAL ARTICLE

Ophthalmia neonatorum: should old ways play a role in new realities?

Cecília Gomes Pereira[1], Joana Ester Batista[1], Gonçalo Torres[2] Sara Cunha[3], Paula Mota[4], and Mariana Martins[5]*

[1]Pediatrics Department; [2]Medical Pathology Department; [3]Neonatology Intensive Care Unit; [4]Pathology Department; [5]Neonatology Intensive Care Unit. Unidade Local de Saúde do Alto Ave, Guimarães, Portugal

Abstract

Introduction and objectives: Neonatal conjunctivitis (NC) prophylaxis was introduced in 1980, reducing its incidence from 10 to 0.3%. However, the epidemiology has evolved in developed countries, with *Neisseria gonorrhoeae* becoming rare and *Chlamydia trachomatis* emerging as a prominent cause. Its necessity in developed countries is currently under debate. In our center, before 2006, prophylaxis was carried out on all newborns. Given the lack of cases of blindness due to gonococcal NC, our hospital has not carried out neonatal eye prophylaxis since 2007. The aim is to evaluate our center's experience over the last 15 years. **Methods:** A retrospective observational study was carried out. All ocular exudate samples were collected between 2008 and 2022. Among the identified cases of gonococcal conjunctivitis, clinical information was collected. **Results:** During this period, a total of 30,417 babies were born in our maternity hospital, and 112 ocular exudates were included. We identified only two cases of gonococcal conjunctivitis, both of which were quickly diagnosed and effectively treated, and there were no cases of gonococcal blindness. The incidence of gonococcal conjunctivitis in this population was 0.06 cases per 1,000 live births. No cases of blindness due to gonococcal infection were identified. **Discussion:** The need for prophylaxis for CN should be discussed. Currently, the indication for it in developed countries is debatable. We believe it is essential to draw up universal guidelines that standardize the existence of possible screening, prophylaxis and its protocol, its application criteria, and the treatment of neonatal conjunctivitis.

Keywords: Infant health. Conjunctivitis. Antibiotic prophylaxis.

Oftalmia neonatal: os métodos antigos devem desempenhar um papel nas novas realidades?

Resumo

Introdução e objetivos: A profilaxia da conjuntivite neonatal (CN) foi introduzida em 1880, reduzindo a sua incidência de 10 para 0,3%. No entanto, a epidemiologia evoluiu nos países desenvolvidos, com a *Neisseria gonorrhoeae* a tornar-se rara e a *Chlamydia trachomatis* a emergir como uma causa proeminente. Atualmente, a sua realização em países em desenvolvimento encontra-se em discussão. No nosso centro, antes de 2006, a profilaxia era efetuada em todos os recém-nascidos (RN). Dada

***Correspondence:**
Cecília Gomes Pereira
E-mail: ceciliapereira@hospitaldeguimaraes.min-saude.pt

Received: 06-06-2024
Accepted: 21-01-2025
https://pjp.spp.pt

Available online: 03-06-2025
Port J Pediatr. 2025;56(4):223-228
DOI: 10.24875/PJP.24000058

a ausência de casos de cegueira devido à CN gonocócica, o nosso hospital não efetua profilaxia ocular neonatal desde 2007. O objetivo é avaliar a experiência do nosso centro nos últimos 15 anos. **Métodos:** Foi efetuado um estudo observacional retrospetivo. Todas as amostras de exsudado ocular foram recolhidas entre 2008 e 2022. Entre os casos identificados de conjuntivite gonocócica, foi recolhida informação clínica. **Resultados:** Durante este período, nasceram um total de 30 417 bebés na nossa maternidade, tendo sido incluídos 112 exsudados oculares. O estudo identificou apenas dois casos de conjuntivite gonocócica, ambos rapidamente diagnosticados e eficazmente tratados, e não se registaram casos de cegueira. A incidência de conjuntivite gonocócica nesta população foi de 0,06:1000 nados vivos. Não foram identificados casos de cegueira devido a infeção gonocócica. **Discussão:** A necessidade de profilaxia para a CN deve ser discutida. Atualmente, a sua indicação nos países desenvolvidos é discutível. Consideramos essencial a elaboração de diretrizes universais que uniformizem a existência de um possível rastreio, a profilaxia e o seu protocolo, os seus critérios de aplicação e o tratamento da conjuntivite neonatal.

Palavras-chave: Saúde neonatal. Conjuntivite. Profilaxia antibiótica.

Keypoints

What is known
- Neonatal conjunctivitis was the most significant cause of neonatal blindness before the 1980s.
- Neonatal antibiotic prophylaxis dramatically reduced the incidence of gonococcal conjunctivitis.
- Today, prophylaxis remains a common practice throughout the world.

What is added
- The prevalence of *Neisseria gonorrhoeae* was low in our group.
- With timely treatment and diagnosis, there is a low risk of serious complications from gonococcal conjunctivitis.
- There were multiple agents identified in ocular exudates, with *Neisseria gonorrhoeae* accounting for only 1.5% of cases.

Introduction

Ophthalmia neonatorum (ON), also known as neonatal conjunctivitis, is an ocular surface disease characterized by inflammation of the conjunctiva that occurs in the first 28 days of life[1,2]. Its incidence is around 1.6 to 12% and it varies geographically and in different clinical environments[2,3]. Its origin can be infectious or chemical. Infectious conjunctivitis is usually contracted from infected mothers during delivery, or from caregivers and can be either viral or bacterial[4]. Bacterial conjunctivitis can be caused by non-sexually transmitted bacteria, which are responsible for 30 to 50% of infections, or by sexually transmitted bacteria such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. The latter can cause corneal perforation and vision loss within 24 hours if left untreated. Chemical conjunctivitis is caused by topical antibiotics such as silver nitrate, gentamycin, erythromycin, or tetracycline[2-5].

Before 1880, ON by *Neisseria gonorrhoeae* was the main cause of permanent blindness in neonates. Back then, Dr. Credè, a German obstetrician, implemented prophylaxis of ON in newborns after birth with excellent results, by instilling one drop of 2% silver nitrate into each eye[6]. As a result, Credè reduced the incidence of neonatal gonococcal conjunctivitis from 10 to 0.3%, which was a huge achievement considering the fact there was no effective treatment available for *Neisseria gonorrhoeae*[3,7]. This practice eventually spread around Europe and America. However, the concentration of silver nitrate used was reduced to 1% due to increased chemical conjunctivitis[8].

As the incidence of *Neisseria gonorrhoeae* decreased, countries such as Denmark, Sweden, the United Kingdom (UK) and, more recently, Canada, have abandoned the universal prophylaxis, since the risk of infection from this bacterium was considered extremely low[6]. In the UK, prophylaxis was abandoned in the 1950s, and no cases of blindness due to ON by *Neisseria gonorrhoeae* were recorded in the subsequent 25 years[9]. However, over the last 20 years, *Chlamydia trachomatis* has become progressively widespread in many countries, becoming more prevalent than *Neisseria gonorrhoeae*[7,10]. With this change of epidemiology and antibiotic evolution, other antibiotics became available for prophylaxis, such as povidone-iodine, erythromycin, 1% tetracycline, and fusidic acid, among others. In fact, a Cochrane review from 2021 identified 14 different prophylactic regimens involving 12 different agents[10]. Nonetheless, there is limited data about an effective antibiotic that prevents *Chlamydia trachomatis* conjunctivitis[10,11]. Table 1 summarizes the main prevention practices for neonatal conjunctivitis worldwide.

Table 1. Current practices of health institutions/countries for ocular prophylaxis in newborns

Institution/country	Suggested practice
American Academy of Pediatrics	0.5% erythromycin prophylaxis is recommended for all newborns. If erythromycin ointment is not available, 1% azithromycin ophthalmic solution is recommended. If that is not available, 0.3% ciprofloxacin ophthalmic ointment may be considered.
Centers for Disease Control and Prevention	Ocular prophylaxis with erythromycin ointment as a single agent is recommended for all neonates.
Canadian Pediatric Association	The recommendations are to screen all pregnant women, treating the mother, and prophylaxis with erythromycin if necessary. Routine prophylaxis is not recommended.
World Health Organization	Ocular prophylaxis to all newborns with one of five different agents is recommended: tetracycline hydrochloride 1% eye ointment, erythromycin 0.5% eye ointment, povidone-iodine 2.5% solution (water-based), silver nitrate 1% solution, and chloramphenicol 1% eye ointment.
Portuguese Society of Neonatology	Only perform in at-risk groups with oxytetracycline. At-risk groups are not well defined.
Turkish Neonatology Society	Since 0.5% erythromycin and 1% tetracycline eye drops are not available in the country, the recommendation is to use 0.3% gentamicin or 0.3% tobramycin instead.
Brazilian Society of Pediatrics	Prophylaxis for all newborns with 2.5% povidone, 0.5% erythromycin ointment or, alternatively, 1% tetracycline. The use of 1% silver nitrate should only be used if the other substances are unavailable.
Italy	Prophylaxis for all newborns, but no current available guidelines.
Denmark, United Kingdom, New Zealand, Norway	No prophylaxis.

As previously stated, there are multiple different practices for prophylaxis worldwide, depending on the epidemiology, level of medical pre-natal care, and the availability of antibiotics. Currently, the WHO recommends topical ocular prophylaxis for prevention of gonococcal and chlamydial conjunctivitis for all neonates, through application on both eyes of 1% tetracycline hydrochloride, 0.5% erythromycin, 2.5% povidone iodine, 1% silver nitrate, or 1% chloramphenicol immediately after birth[12]. However, it is important to bear in mind that WHO recommendations apply to every nation in the world, including countries with a high level of gonococcal infections.

Currently, in Portugal, there is a lack of guidance on this subject. Thus, there is no universal screening of these agents in pregnant women, nor are there clear indications for prophylaxis (who, when, and with what). For these reasons, the decision to screen during pregnancy and for neonatal prophylaxis is left to the discretion of each maternity hospital.

In our center, a maternity hospital equipped with a level III Neonatal Intensive Care Unit (NICU), prior to 2006, prophylaxis was performed in all neonates with topical fusidic acid. In 2006, after a review of the literature, there was a transitional period lasting one year in which prophylaxis was only implemented in newborns admitted to the NICU or the Special Care Unit, neonates born from unsupervised pregnancies, in the case of prolonged rupture of membranes, and in the case of any suspected maternal infection. During that time, no cases of gonococcal conjunctivitis were diagnosed, and, therefore, since 2007, our hospital does not perform neonatal ocular prophylaxis.

In view of this, the authors aim to evaluate the experience of our center for the past 15 years without prophylaxis for ON. During this time, unlike other national centers, no neonatal conjunctivitis prophylaxis was carried out at our center. The aim of analyzing the period since this change was to see if *N. gonorrhea* infections and, more importantly, serious consequences of this infection were found. We believe that this could be of clinical importance in changing common practice in Portugal and Europe.

Methods

A retrospective observational study was performed. We collected all ocular exudate samples during the

period from 2008 to 2022, a total of 15 years. During this period, swabs were taken from the external ocular exudate of all patients admitted for or with neonatal conjunctivitis, or previously hospitalized patients with clinical onset of conjunctivitis. The collection was carried out by the nursing team of the neonatal intensive care unit. *Neisseria gonorrhoeae* was identified by exudate culture. Cases of *Chlamydia trachomatis* were not analyzed since it does not grow by culture and the polymerase chain reaction (PCR) method was not available at that time.

Among the identified cases of gonococcal conjunctivitis, we analyzed the time of onset, the antimicrobial therapy administered, clinical evolution, complications, and maternal history of known sexually transmitted infection. Descriptive analysis was used.

Results

In the past 15 years, a total of 30,417 babies were born in our maternity unit. This study included a total of 112 ocular exudates. An agent was detected in all the exudates collected. Table 2 shows the agents identified and their frequency. A contaminating agent was assumed in 39 (34.8%) of the samples and no therapeutic action was taken.

Of these, only two were positive for *Neisseria gonorrhoeae* (Table 3).

The first case, identified in 2011, was a healthy baby girl born at 40 weeks of gestation by eutocic delivery. There was no known maternal history of sexually transmitted infection. Clinical signs of conjunctival hyperemia and abundant purulent exudate become visible on the fourth day of life. She was treated with a single dose of intravenous ceftriaxone 125 mg with clinical resolution. No long-term sequelae were recorded.

The second positive culture belonged to a previously healthy boy, also born by eutocic delivery at 37 weeks in 2018. There was also no known maternal history of sexually transmitted infection. The clinical signs appeared on the first day of life. He was also treated with intravenous ceftriaxone 125 mg, with complete resolution and no long-term sequelae.

Both individuals were born in our center. Therefore, in 15 years, out of 30,417 live births, two cases of gonococcal conjunctivitis were identified.

Table 2. Microbiological agents identified in ocular exudate cultures, their frequency, and percentage

Microbiological agent identified	Frequency	Percentage
Escherichia coli	34	25.8
Staphylococcus aureus	22	16.7
Streptococcus sp.	16	12.1
Staphylococcus epidermidis	13	9.8
Haemophilus influenzae	9	6.8
Pneumococcus	5	3.8
Streptococcus mitis/ Streptococcus oralis	4	3
Staphylococcus hominis	3	2.3
Enterobacter cloacae	3	2.3
Enterococcus faecalis	3	2.3
Klebsiella pneumoniae	3	2.3
Staphylococcus haemolyticus	2	1.5
Neisseria gonorrhoeae	2	1.5
Streptococcus Grupo C	1	0.8
Streptococcus mitis	1	0.8
Citrobacter koseri (diversus)	1	0.8
Corynebacterium sp.	1	0.8
Haemophilus parainfluenzae	1	0.8
Klebsiella oxytoca	1	0.8
Morganella morganii ssp morganii	1	0.8
Pseudomonas aeruginosa	1	0.8
Serratia marcescens	1	0.8
Staphylococcus capitis	1	0.8
Staphylococcus coag. negativo	1	0.8
Streptococcus pneumoniae	1	0.8
Streptococcus vestibularis	1	0.8

Discussion

We report our experience over a 15-year period, after ocular prophylaxis was no longer recommended in our center. During this period, only two cases of gonococcal conjunctivitis were diagnosed. Both were identified rapidly and treated promptly, with complete resolution of symptoms and no sequelae. Therefore, no cases of gonococcal blindness were recorded.

We can all agree that Credé's prophylaxis was revolutionary. Back then, the incidence of *Neisseria*

Table 3. Identified cases of gonococcal conjunctivitis between 2008 and 2022

Year of diagnosis	Sex	Gestational age	Age of onset	Type of birth	Maternal STI history	Supervised pregnancy	Treatment	Sequelae
2011	Female	40w	4 days	Eutocic	Unknown	Yes	Ceftriaxone 125 mg	None
2018	Male	37w + 4d	1 day	Eutocic	Unknown	Yes	Ceftriaxone 125 mg	None

STI: sexually transmitted infection.

gonorrhoeae was high, and adequate treatment was not available.

Nevertheless, with the evolution of modern medicine, our reality has shifted substantially, mainly in developed countries. The prevalence of ophthalmia neonatorum and the causative organisms vary across the world, and it has become rare in high-income countries, mainly due to increased knowledge about sexually transmitted infections (STIs) and better treatment, higher standards of maternal healthcare, and ocular prophylaxis at birth. For example, in the United States, *Neisseria gonorrhoeae* has a prevalence of 0.3 per 1,000 live births[7]. However, gonococcal infection is increasing in the population, and this should be taken into account in newer guidelines[13].

Besides the epidemiological shifts, nowadays, the diagnosis of this pathogen has become increasingly rapid and precise, with a PCR of *Neisseria gonorrhoeae* now available within 90 minutes[14]. In addition, treatment for ON by *Neisseria gonorrhoeae* with a single dose of ceftriaxone is effective and fast[15]. Added to this, the fact that in Portugal the national health system is free and accessible to all ensures treatment is easily available. Although routine screening for *Neisseria gonorrhoeae* during pregnancy is not performed in many countries, a structured surveillance care for all pregnancies can be an opportunity to raise awareness about STIs among women and to treat those with symptoms and their partners[16].

In this discussion, it is also important to bear in mind that neonatal conjunctivitis prophylaxis does not seem to have an effect on conjunctivitis caused by *chlamydia trachomatis*, currently the main sexually transmitted agent causing infection[10,11]. Therefore, it would probably be more advantageous to treat maternal infection before delivery.

The side effects of antibiotic therapy should also be taken into account, such as chemical conjunctivitis[2], antimicrobial resistance[17], and changes in the ocular surface microbiota[18].

No antimicrobial regime appears to be superior nor is any antibiotic particularly effective against *Neisseria gonorrhoeae* and Chlamydia, therefore, the drafting of a protocol is highly debatable. Moreover, recent data on prevention of adverse outcomes, such as blindness or visual compromise is lacking[10,11].

Lastly, the costs associated with routine prophylaxis should be considered. Although it is economical individually, on a population level it is expensive. In addition to the costs of the prophylaxis, the costs of adverse side effects should also be taken into consideration. A study in Canada determined that for this intervention to be cost-effective the prevalence of gonorrhea infection would need to be 5.5 times higher, and the number needed to treat one case of ophthalmia neonatorum blindness was 500,000 newborns[19].

For these reasons, the need for ON prophylaxis must be addressed since there are no current guidelines in most European countries. It is highly acceptable that in low and middle-income countries and areas of high risk of untreated maternal gonococcal infection, neonatal ocular prophylaxis must be performed. However, the indication to perform it in high-income countries is debatable[5].

Considering that, it should be discussed whether STI screening in pregnancy is a more cost-effective prophylaxis, given the fact that we are preventing neonatal conjunctivitis through screening and treating STIs in sexually active adults. Besides that, this strategy avoids the unnecessary administration of antibiotics to newborns and their potential side effects. This approach was adopted by some countries, like Canada, after suspending neonatal prophylaxis[8].

The authors argue that, based on epidemiology, the limited effectiveness of neonatal prophylaxis, and diagnostic developments, the best approach would be to screen pregnant women for these agents, allowing them and their partners to be treated, considerably reducing the risk of neonatal infection, while at the same time reducing the transmission of these agents. We also believe that whatever strategy is adopted, it should always take into account migratory movements, the number of unsafe pregnancies, and promiscuity, and that data should be monitored continuously.

Currently, the national guidelines recommend the use of ocular prophylaxis in at-risk subpopulations such as unsupervised pregnancies or parents with risk factors for sexually transmitted diseases. However, these factors are not clearly defined[20].

Overall, we believe that it is crucial to build universal guidelines to standardize the existence of possible screening, prophylaxis, and its protocol, its criteria for implementation, and treatment of neonatal conjunctivitis.

Author contributions

C. Gomes Pereira: conception and design of the study, report, review or other type of work or paper; acquisition of data either from patients, research studies, or literature; anayisis or interpretation of data either from patients, research studies, or literature; drafting the article; critical review of the article for important intellectual content; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the work. J. E. Batista: acquisition of data either from patients, research studies, or literature; anayisis or interpretation of data either from patients, research studies, or literature; critical review of the article for important intellectual content; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the work. G. Torres: acquisition of data either from patients, research studies, or literature; anayisis or interpretation of data either from patients, research studies, or literature; drafting the article; critical review of the article for important intellectual content; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the work. S. Monteiro Cunha: critical review of the article for important intellectual content; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the work. P. Mota: acquisition of data either from patients, research studies, or literature; drafting the article; critical review of the article for important intellectual content; final approval of the version to be published; agreement to be accountable for the accuracy or integrity of the work.

Funding

None.

Conflicts of interest

None.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. Celik M. Ocular prophylaxis in the newborn. European Eye Research. 2022;2(2):80–3.
2. Khan A, Anders A, Cardonell M. Neonatal Conjunctivitis. NeoReviews. 2022 Sep 1;23(9):e603–12.
3. Matejcek A, Goldman RD. Treatment and prevention of ophthalmia neonatorum. Canadian Family Physician [Internet]. 2013 Nov 1;59(11):1187–90. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828094/
4. Manasseh GSL, Amarakoon S, Photiou V, Arruti N, Borman AD. Approach to conjunctivitis in newborns. BMJ. 2022 Mar 23;e068023.
5. Malik ANJ, Gilbert C. Cochrane corner: interventions for preventing ophthalmia neonatorum. Eye. 2021 Oct 12;36(2):356–7.
6. Credè C. Die Verhutung der augenentzundung bei Neugeborenen, der haufigsten und wichtigsten Ursache der Blindheit, 63 p.p.A Hirschwald, Berlin, 1884. Based on a translation by H. Thomas. Surv Ophthalmol 1963;4:367–70
7. Auriti C, Mondì V, Aversa S, Merazzi D, Lozzi S, Petroni S, et al. OPHTHALMIA NEONATORUM in Italy: it is time for change. Italian Journal of Pediatrics. 2021 Dec;47(1).
8. Moore DL, MacDonald NE, Canadian Paediatric Society, Infectious Diseases and Immunization Committee. Preventing ophthalmia neonatorum. Paediatrics & child health [Internet]. 2015;20(2):93–6. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4373584/
9. Darling EK, McDonald H. A Meta-analysis of the Efficacy of Ocular Prophylactic Agents Used for the Prevention of Gonococcal and Chlamydial Ophthalmia Neonatorum. Journal of Midwifery & Women's Health. 2010 Jul 8;55(4):319–27.
10. Kapoor VS, Evans JR, Vedula SS. Interventions for preventing ophthalmia neonatorum. Cochrane Database Syst Rev. 2020 Sep 21;
11. Smith-Norowitz TA, Ukaegbu C, Kohlhoff S, Hammerschlag MR. Neonatal prophylaxis with antibiotic containing ointments does not reduce incidence of chlamydial conjunctivitis in newborns. BMC Infect Dis. 2021 Mar 17;21(1).
12. 'WHO recommendations on newborn health: guidelines approved by the WHO Guidelines Review Committee' (2017)
13. Jose PP, Vivekanandan V, Sobhanakumari K. Gonorrhea: Historical outlook. Journal of Skin and Sexually Transmitted Diseases [Internet]. 2020 Oct 15;2(2):110–4. Available from: https://jsstd.org/gonorrhea-historical-outlook/
14. Han Y, Shi M, Jiang Q, Le W, Qin X, Xiong H, et al. Clinical Performance of the Xpert® CT/NG Test for Detection of Chlamydia trachomatis and Neisseria gonorrhoeae: A Multicenter Evaluation in Chinese Urban Hospitals. Frontiers in Cellular and Infection Microbiology. 2022 Jan 3;11.
15. Olusanya B, Baiyeroju A. Emergency management: ophthalmia neonatorum. Community eye health [Internet]. 2018 [cited 2024 Feb 22];31(103):61. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6253317/
16. Direção Geral de Saúde. Organização dos cuidados de saúde na preconceção, gravidez e puerpério - Portal das Normas Clínicas [Internet]. normas.dgs.min-saude.pt. 2023 [cited 2024 May 10]. Available from: https://normas.dgs.min-saude.pt/2023/01/27/organizacao-dos-cuidados-de-saude-na-preconcecao-gravidez-e-puerperio/
17. Meyer D. Ophthalmia neonatorum prophylaxis and the 21stcentury antimicrobial resistance challenge. Middle East African Journal of Ophthalmology. 2014;21(3):203.
18. Petrillo F, Petrillo A, Marrapodi M, Capristo C, Gicchino MF, Montaldo P, et al. Characterization and Comparison of Ocular Surface Microbiome in Newborns. Microorganisms. 2022 Jul 10;10(7):1390.
19. Rowlands EC, McGregor E, Coyle D. Universal ophthalmia neonatorum prophylaxis in Ontario: a cost-effectiveness analysis. CMAJ Open. 2023 Jan 1;11(1):E33–9.
20. Sociedade Portuguesa de Neonatologia. "Cuidados Gerais ao Recém-Nascido Saudável" [Internet]. 2023 Jun [cited 2024 May 19]. Available from: https://www.spneonatologia.pt/wp-content/uploads/2023/08/Cuidados-gerais-ao-RN-Saud%C3%A1vel.pdf