A case of co-infection with head lice and varicella in a child: considerations for rational management

Abstract. Pediculosis and varicella, common in children, typically pose no significant diagnostic or treatment challenges. However, the ongoing full-scale war in Ukraine has led to severe humanitarian consequences, including mass migration and health care infrastructure damage. Under such conditions, standard treatment modalities, including isolation and hygiene measures, may be impracticable. These challenges underscore the need for adapting patient management strategies to crisis conditions. We report a case of a previously well 10-year-old female, presenting with pediculosis capitis and varicella co-infection, complicated by folliculitis. Pediculosis had been detected by the parents one week before the onset of varicella, and they self-administered a topical anti-pediculosis agent based on clearol and dimethicone once. On the 12th day of varicella infection, we found purulent rash elements on the scalp, severe pruritus, and presence of lice eggs and nits. Considering the evidence of folliculitis on the scalp, which complicated the use of external pediculicides and hygienic procedures, the case necessitated a tailored treatment approach. This included oral cefuroxime for bacterial superinfection, and two doses of oral ivermectin for pediculosis 200 mcg/kg one week apart, along with chloroxyrimine hydrochloride for pruritus management. The strategy resulted in elimination of head lice infestation with no adverse events. This case illustrates the critical need for updated clinical protocols and health care provider education on optimal treatment practices, especially in crisis contexts. The coexistence of varicella with a pediculosis infection precipitated a secondary bacterial infection requiring systemic antibacterial treatment. Clinical research provides evidence of oral ivermectin effectiveness in pediculosis treatment when topical pediculicides cannot be utilized. To mitigate varicella complications and control epidemic processes, integrating varicella vaccination into the national immunization schedule is recommended. Moreover, for cases with varicella and ectoparasitic infections, systemic treatment with antiviral and anti-parasitic agents like acyclovir and ivermectin should be considered to minimize the risk of superinfection. The registration of oral ivermectin for pediculosis treatment by state health authorities is advocated to formalize its use in clinical practice.

Keywords: varicella; pediculosis; treatment; acyclovir; ivermectin; children

Introduction

Pediculosis and varicella, common in children, typically pose no significant challenge for diagnosis or treatment under usual circumstances. However, for almost two years a full-scale war has been going on in Ukraine, caused by the invasion of the Russian Federation. This war has naturally led to a number of dramatic humanitarian consequences, including mass migration and significant damage to the health care infrastructure [1, 2]. In such settings, the diagnosis of infectious diseases may be delayed because parents do not inform health care providers of their child's symptoms due to difficulties in accessing medical care. At the same time, the transmission of infectious diseases is facilitated in crowded environments (evacuation and bomb shelters), potentially causing outbreaks. Furthermore, standard treatment approaches may be impracticable in such unfavorable social and living conditions. This applies in particular to isolation measures, hygiene procedures, the ability to provide local treatment, and there is an increased likelihood of treatment discontinuation. An unfavorable and complicated course of infectious diseases may result from these factors. Therefore, the above represents a significant public health system challenge, underscoring the need for adapting standard patient management strategies to existing crisis conditions.
Pediculus humanus capitis infection, which causes head lice infestation, is classified as a socially significant infection. According to the National Center for Public Health (CPH), in the pre-war period head lice infestation was the most frequent of all three forms of pediculosis registered in Ukraine. It accounted for 96.1% of the overall pediculosis structure (CPH, 2019). According to the official open registry data, last year in Ukraine the incidence of pediculosis and phthiriasis increased by 30.1% (CPH, 2023). In the global scope, the problem of pediculosis remains quite a relevant public health issue in different world regions, including Europe [3–5].

It is generally accepted that pediculosis is diagnosed clinically without the use of laboratory diagnosis. In conditions of health care system damage due to war or natural disasters, this is essential for decision-making and implementation of practical measures by medical or surrounding non-medical personnel. At the same time, from a decision-making perspective, such contexts necessitate a reevaluation of treatment efficacy and safety of available alternative treatment approaches. Therefore, we believe that our experience of using ivermectin, a systemic antiparasitic chemotherapy (SAPCT) medication, for pediculosis with varicella co-infection complicated by folliculitis may be of interest to pediatricians, general practitioners and pediatric infectious disease specialists operating in conflict zones including in the context of the war in Ukraine.

Case presentation

We observed a case of a mixed infection of Pediculus capitis infestation and varicella in a previously healthy 10-year-old girl. The child comes from a socially adjusted family and resides in Dnipro.

On September 12, 2023, the twelfth day of varicella infection, the parents consulted an infectious diseases specialist to determine the management for head lice infestation in the child. The parents revealed pediculosis a week before the varicella onset. They did not seek medical advice but used combing and self-administered a treatment shampoo based on a combination of clearol and dimethicone once, which are topical pediculicides.

The parents consulted a pediatrician about their child’s varicella infection. The pediatrician examined the child and found no living lice, but nits were still present. The pediatrician recommended outpatient observation, and treatment of viral exanthema elements with fucorcinum, the aniline alcohol-based dye, applications. According to the parents’ statement, the pediatrician did not give any advice on fever management, so the parents self-prescribed ibuprofen.

Epidemiological investigation failed to identify sources of varicella and pediculosis infection in the case. Parents deny cases of these diseases in family members and other close contacts.

The child’s life history suggests that she has no chronic somatic, psychiatric, and infectious diseases, and is fully vaccinated according to the national immunization schedule.

Objectively, the child is well-appearing, with no systemic symptoms. She complains of severe pruritus and pustules located mainly in the scalp area. Examination of the trunk and limbs revealed elements of viral exanthema in the regressive phase (excoriations and desiccation). However, on the scalp we detected purulent and ulcerated rash elements — folliculitis, and presence of lice eggs and nits on the hair (Fig. 1).

Considering the presence of varicella complication in a form of secondary bacterial infection (folliculitis), we prescribed a five-day course of antimicrobial treatment — oral cefuroxime 30 mg/kg/day in two doses. For pediculosis, ivermectin was given orally at a dose of 200 mcg/kg once. In addition, we administered chloropyramine hydrochloride 12 mg daily in two doses to control pruritus while it is present.

To prevent scalp trauma and dissemination of microbial infection, hygiene measures were postponed until the third...
day after ivermectin administration and the start of antibio-
tic therapy. Then, we advised careful daily mechanical re-
moval of lice and nits with a comb and local application of
0.05% chlorhexidine solution twice a day after showering.
Nail hygiene, washing and ironing of personal items, es-
specially headgear, were mandatory recommendations.

On the seventh day after the first dose of ivermectin, no lice, eggs or nits were found (Fig. 2).

Considering the history of the disease with an unknown source of lice infestation, we decided to administer an addi-
tional dose of oral ivermectin (200 mcg/kg once). The child tolerated ivermectin well, with no adverse reactions.

One week after the second dose of ivermectin, the scalp area was completely clear from pediculosis signs.

At the control telephone visit two weeks after the second
dose of ivermectin, the parents reported no signs of pedicu-
losis in the girl and her family members. The child is clini-
cally healthy and has resumed the school attendance.

Three months after the end of treatment, the child’s pa-
rents reported no recurrent episodes of lice infestation. The

Disease course is favorable in most cases. In addition, the ad-
cations, and fatal outcome, while the course of varicella in

The above two examples of suboptimal drug selection
highlight the importance of education of the health care
providers and adult caregivers on optimal treatment prac-
tices. However, unfortunately, these areas of work can also
be difficult to address in the crisis contexts.

According to the national official guidelines on varicella
management, systemic antiviral chemotherapy (SAVCT),
which is limited to acyclovir in pediatric practice in Ukraine,
is not routinely administered in immunocompetent children
aged 2–12 years [15, 16]. This approach is based on several
arguments. Firstly, SAVCT does not lead to viral elimina-
tion, but is used to reduce the risk of severe disease, compli-
cations, and fatal outcome, while the course of varicella in
this age group is favorable in most cases. In addition, the ad-
ministration of SAVCT is associated with potential risks of
systemic adverse events and an increase in treatment costs, which, in
the absence of mandatory immunoprophylaxis, represents a
permanent economic burden on society. However, none of
the national guidelines discusses the rationale of prescrib-
ing SAVCT to children with infectious and non-infectious
inflammatory skin diseases other than atopy [15], and in

Discussion

This case illustrates how systemic deficiencies in the
organization of public health, particularly the lack of man-
datory varicella immunoprophylaxis in the pediatric popu-
lation, can lead to medical errors, complications, and un-
favorable disease course. Vaccination against varicella can
and should be recommended by health care providers as an
adjunct to vaccinations included in the national immuniza-
tion schedule. Unfortunately, the importance of informing
parents about the benefits and feasibility of extended child-
hood immunization and making such a recommendation is
not always appreciated by medical professionals. In addi-
tion, in the context of a humanitarian crisis, problems with
vaccine supply and access are likely.

Furthermore, the case highlights the potential preventa-
tive role of varicella vaccination in terms of complications. Varicella zoster infection with an ongoing head lice infes-
tation led to the development of a third infection, namely
dermal microbial superinfection, caused by a damage to the
viral exanthema elements due to severe itching. This sub-
sequently led to long-term negative consequences such as
the formation of a permanent cosmetic skin defect in the
form of scarring and recurrent streptodermia in the area of
primary involvement.

Bacterial superinfection in varicella patients is most of-
ten caused by Streptococcus pyogenes (group A hemolytic
Streptococcus) and potentially poses a threat of developing
purulent septic diseases (cellulitis and phlegmon, toxic
shock syndrome, sepsis, etc.) [6–8], thus requiring the use
of systemic antibacterial chemotherapy. Simultaneously,
the rampant antimicrobial resistance in microorganisms,
causen in part by the extensive use of antimicrobial agents,
have become an increasingly urgent global problem in recent
years, stressing the importance of their judicious adminis-
tration [9]. In this context, the emergence of such a disease

complication requiring the use of systemic antibacterial
medications, which could have been prevented with appro-
priate management, should be considered as a negative con-
sequence not only at the short-term individual level (for the
patient), but also at the long-term population level (for the
community as a whole) [9, 10].

The development of a secondary bacterial skin infection
in this case could also have been promoted by a suboptimal
parental choice of medication to reduce the child’s tem-
perature. In recent decades, a body of scientific evidence
has accumulated that links the use of non-steroidal anti-in-
flammatory drugs such as ibuprofen in Varicella zoster virus
infections with the development of microbial superinfec-
tion, including severe cutaneous forms [11–13]. Although
a number of official clinical guidelines and recommenda-
tions, including international ones, still do not explicitly
prohibit the use of ibuprofen for fever management in chil-
dren with Varicella zoster virus infections, acetaminophen
(paracetamol) is currently considered the optimal and safest
choice of antipyretic therapy in such case [14].

The use of topical agents to treat the exanthema ele-
ments in varicella deserves special attention. It should be
noted that until relatively recently, Ukraine had a protocol
for the diagnosis and treatment of varicella in children from
2004 (Order of the Ministry of Health of Ukraine No. 354),
which became invalid on September 1, 2023. This docu-
ment included recommendations on the treatment of rash

elements with aniline dyes. However, two clinical guidelines
on varicella approved by the Ministry of Health of Ukraine
in 2016 and 2017 remain in force [15, 16], recommending
the topical use of calamine-containing lotions instead to
reduce pruritus. From the perspective of current scientific
research, the use of aniline dyes for the treatment of vari-
cella rash has no evidence of efficacy and is not safe. Aniline
alcohol-based dyes do not prevent ectoparasitic and bacte-
rial superinfections. Moreover, they may exhibit transcuta-
neous systemic toxicity due to uncontrolled reabsorption of
chemical compounds when used on large areas of skin [17, 18],
and they also have carcinogenic potential [19].

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case of difficult sanitary and hygienic conditions (crowding, evacuation, impossibility of personal hygiene, etc.). It should be noted that currently, there is still modest high-quality evidence on the efficacy of oral acyclovir in preventing cutaneous complications associated with varicella [20]. Simultaneously, several international guidelines consider broader indications for acyclovir in varicella. In particular, the American Academy of Pediatrics considers any chronic skin disease to be a risk factor for a severe course of varicella and therefore recommends oral acyclovir therapy for this group of patients [21–23].

Regarding Pediculus capitis infestation, it is useful to note that therapy of pediculosis is focused on two objects: the infected person as the sole source of infection and abiotic one (clothing, premises, household items) as a factor of pathogen transfer. Therapeutic measures for humans include the simultaneous application of physical/mechanical actions and pharmacological agents (pediculicides). The non-pharmacological (mechanical) pediculosis treatment implies combing with a thick comb to remove lice, eggs, and nits, haircut, or shaving.

Pediculicides are classified according to their mechanism of action as insecticides (pyrethrins, pyrethroids, organophosphates, carbamate, dihydroavermectin) and agents with a purely physical mechanism of action (topical occlusive agents), which act through dehydrating the lice or blocking their respiration (e.g. a combination of clearol/dimethicone compounds). Pediculicides are available in the form of topical preparations (creams, shampoos, soaps) and systemic medications (SAPCT agents).

In case of microbial superinfection or varicella, the administration of topical pediculicides with any mechanism of action may be potentially dangerous as it may contribute to further spread of skin inflammation and dissemination of bacterial infection.

In addition, during humanitarian emergencies, adverse social and living conditions (evacuation, bomb shelters, etc.) may pose certain difficulties in the use of topical pediculicides, mainly due to an impaired access to water and hygienic showers. Non-pharmacological pediculosis treatment may also be complicated in such environments. Accordingly, the use of systemic pediculicides appears the most rational tactics in such unfavorable context.

Butadione is the only agent listed as a pediculicide of the SAPCT group in the Order of the Ministry of Health of Ukraine No. 38 dated March 28, 1994 “Organization and implementation of measures to combat pediculosis”. Butadione is characterized by a wide range of adverse reactions but lacks evidence of efficacy and safety. It is therefore not used in pediatric practice.

Instead, ivermectin, another medication from the SAPCT group, is currently available for treatment of pediculosis in international clinical practice. Ivermectin when administered orally has shown high efficacy in eliminating head lice infestations, including in case of multidrug-resistant ectoparasites and in difficult-to-treat pediculosis [24]. Multiple studies, most of which enrolled children aged 5–15 years, have estimated the parasite clearance rate at 93–97 % 7–15 days after oral ivermectin treatment [25–27]. Overall, the clinical research findings to date, although not definitive, suggest that oral ivermectin is non-inferior or superior to other topical treatment for head lice infestation, while being well tolerated and favorably perceived by patients and caregivers [28].

Ivermectin when administered orally demonstrates paralyzing effect on Pediculus humanus capitis. Ivermectin enters the body of the louse through the human blood on which the parasite feeds. The optimal regimen for ivermectin has not been definitively ascertained, but the drug is usually given at a single dose of 200 mcg/kg [29]. In some cases, a second dose is required to ensure complete eradication, given at intervals of 7–10 days [27]. The drug is not recommended for use in children weighing less than 15 kg [29].

However, ivermectin is not currently licensed as a pediculicide in Ukraine. In the National List of Essential Medicines approved by the CMU Resolution No. 333 dated March 25, 2009 (as amended by the CMU Resolution No. 1081 dated December 13, 2017), it is included only as an antimalarial drug. Therefore, in this clinical case, we administered oral ivermectin in the treatment of pediculosis for indications that are not officially registered in the country (off-label use). This decision was made because using topical pediculicides was problematic due to the presence of pustular rash elements on the scalp (folliculitis), which occurred as a complication of varicella infection. We justified the rationale for the choice, informed the parents and obtained their consent for the use of the given treatment.

Since ivermectin as a SAPCT medication is not routinely used in Ukraine, the preserved susceptibility of Pediculus capitis is expected. The aforementioned is extremely important considering the continuing humanitarian crisis caused by the ongoing war waged by the Russian federation against Ukraine.

Conclusions

1. To reduce the risk of varicella complications and control epidemic processes, integrating varicella vaccination into the national immunization schedule is recommended for state regulatory health authorities. In the meantime, health care providers should actively educate parents about the benefits of extended vaccination schedule and recommend varicella vaccination when the vaccine is available.

2. Prescribing systemic treatment with acyclovir and other anti-herpetic drugs in immunocompetent patients with varicella and concomitant ectoparasitic infection (Pediculus capitis, scabies, bed bug and flea bites, etc.) should be considered a rational tactic to reduce the risk of microbial superinfection.

3. Oral ivermectin should be considered as a the first-line treatment for pediculosis when topical pediculicides cannot be utilized.

4. State authorities regulating the use of pharmacological products in clinical medicine should register oral ivermectin as a medication for pediculosis, since ivermectin is the only available SAPCT agent.

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Випадок поєднаної інфекції педикульозу та вітряної віспи в дитини: питання раціонального менеджменту

Резюме. Педикульоз та вітряна віспа, поширені в дітей, за принципом не становлять значних проблем для діагностики та лікування. Однак повномасштабна війна, що триває в Україні, призвела до серйозних гуманітарних наслідків, включно з масовою міграцією та пошкодженням інфраструктури системи охорони здоров’я. За таких умов стандартні методи лікування, включаючи ізоляцію та гігієнічні заходи, можуть бути нездійснені. Ці виклики підкреслюють необхідність адаптації стратегій ведення пацієнтів до кризових умов. Наведено випадок поєднаної інфекції головного педикульозу та вітряної віспи, ускладненої фолікулітом, у раніше здорової дитини 10 років. Педикульоз виявлено батьками за тиждень до захворювання на вітряну віспу, вони самостійно одноразово застосували місцевий антипедикульозний засіб на основі клеаролу і диметикону. На 12-й день захворювання на вітряну віспу ми підозрювали гнійні елементи висипу на волосистій частині голови, сильний свербіж, наявність яєць вошей та гнид. З огляду на фолікуліт, що ускладнював застосування топічних педикуліцидів та гігієнічних процедур, випадок потребував індивідуального підходу до терапії. Останній включав цефуроксим перорально для лікування бактеріальної суперінфекції та дві дози івермектину перорально для лікування педикульозу — по 200 мкг/кг з інтервалом у тиждень, а також хлоропіраміну гідрохлорид для зменшення свербежу. Стратегія привела до ліквідації педикульозу без розвитку побічних ефектів. Цей випадок ілюструє потребу в оновленні клінічних протоколів та навчанні медичних працівників оптимальними методами лікування, особливо в кризових умовах. Поєднання вітряної віспи та педикульозу призвело до розвитку бактеріальної суперінфекції, що потребувала системної антибіотикотерапії. Клінічні дослідження підтверджують ефективність перорального івермектину для лікування педикульозу у випадках, коли місцеві педикуліциди не можуть бути використані. Для запобігання ускладненням вітряної віспи та контролю епідемічних процесів рекомендується інтегрувати вакцинацію проти вітряної віспи до національного календаря щеплення. Крім того, у випадках поєднання вітряної віспи та ектопаразитарних інфекцій слід розглянути можливість системного лікування протиінфекційними препаратами, такими як ацикловір та івермектин, для мінімізації ризику суперінфекції. Ми вважаємо доцільною державну реєстрацію перорального івермектину для лікування педикульозу, щоб формалізувати його використання в клінічній практиці.

Ключові слова: вітряна віспа; педикульоз; лікування; ацикловір; івермектин; діти

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