ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 06, pp.33496-33499, June, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EVOLUTION OF THE EFFECTIVENESS OF PEREMETHERIN AND TRIMETHOPRIM/SULFOMETHOXAZOLE ON PEDICULOSIS CAPITIT AND SOME BACTERIA ISOLATED FROM ITS COMPLICATION

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ARTICLE INFO

Article History:
Received 04th March, 2016
Received in revised form
27th April, 2016
Accepted 15th May, 2016
Published online 30th June, 2016

Key words:

Pediculosis capitis,
Trimethoprim /Sulfamethoxazol,
Permetherin,
Staphylococus aureus,
Streptococcus pyogenes.

ABSTRACT

Background: Head lice infestation caused by Pediculus humanus var. Capitis, is the most prevalent human ectoparasitic disease worldwide, head lice are haematophagous, head lice infestation is particularly frequent among children 3-11 stigmatization and psychological distress. Traditional pharmacological therapies for the human head louse, Pediculus humanus Capitis, have focused on 1 or 2 courses of various ovicidal and pediculicidal topical therapies, permetherin 1% as first-line treatment for head lice, permetherin is abroad-spectrum synthetic pyrethroid, and trimethoprim /sulfamethoxazole is presumed to work by ridding lice of bacteria.

Methods and Patients: Seventy five females patients with pediculosis capitis included in the study, their ages ranged from 3 to 60 years. In 40 patients the pediculosis was complicated by secondary bacterial infection. The patients were divided in to three groups, each group consisted of twenty five patients.

Group 1:-The patients were treated by 5% permetherin solution applied for three successive days for 30 minutes for each application and repeated after 10 days as a single application for 30 minutes.

Group 2:-Was treated by trimethoprim /sulfamethoxazole tablet or solution according to the age for 5 days.

Group 3:- Was treated by combination of 5% permetherin solution and oral trimethoprim /sulfamethoxazole in similar does to the first and second groups. Swabs were taken from patients with bacterial infection.

Results: The study revealed that 23(92%) patients of the first group who was treated by 5% permetherin solution, was cleared, 20(80%) patients from the second group who was treated by oral trimethoprim / sulfamethoxazole, also cleared and all the patients in the third group 25(100%) who were treated by a mixture of 5% permetherin topically and oral trimethoprim / sulfamethoxazole. Of those who were complicated by secondary bacterial infection 40(60%), 30(75%) the cultures shows growth of Staphylococus aureus, 6(15%) Streptococcus pyogenes and 4(10%) mixed growth of both Staph and Strep. The cultures which were tested by 5% permetherin shows no inhibition zone but those cultures which were tested by trimethoprim /sulphamethoxazol shows significant inhibition zone. It was concluded that permetherin was ineffective as antibacterial agent but it was highly effective as pediculocidal agent and it was more effective when combined with oral trimethoprim /sulfamethoxazol.

Citation: Khudhair khalf Al-Kayalli and Burooj Mohammed Razooqi, 2016. "Evolution of the effectiveness of Peremetherin and Trimethoprim/Sulfomethoxazole on Pediculosis capitit and some bacteria isolated from its complication", *International Journal of Current Research*, 8, (06), 33496-33499.

INTRODUCTION

Head lice infestation caused by Pediculus humanus var. C apitis, is the most prevalent human ectoparasitic disease worldwide, head lice are haematophagous, wingless insects belonging to the order Anoplura. Head lice infestation is particularly frequent among children 3-11 stigmatization and psychological distress (Chosidow *et al*., 2000). Traditional pharmacological therapies for the human head louse, Pediculus humanus var. Capitis, have focused on 1 or 2 courses of various ovicidal and pediculicidal topical therapies. Head lice, within the past 20 years, have developed resistance to nearly all first- line pharmacotherapy in the United State (Meinking *et al*., 2002). The American Academy of Pediatrics recommends permetherin 1% as first-line treatment for head lice, a medicine for which resistance in the United States is extensively documented (Frankowsi and Weiner, 2002; Pollack

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et al.,1999; Lee *et al*., 2000). Head lice infestations are not merely a nuisance. Untreated infection can lead to poor sleep and excoriation, which can occasionally become super infected with methicillin-resistant Staphylococcus aureus (MRSA) or Streptococcus (Mumcuoglu *et al*., 1991). It is estimated that pharmacotherapy alone for head lice infestations costs the US economy up to $240 million per year. Estimates for combined direct and in direct costs may be as a high as $1 billion per year (Hansen and OHaver, 2004). Therapeutic option includes:- Lindane (y-benzene hex chloride) non competitively in habits the y-amino butyric acid (GABA) receptor, which typically binds GABA, an inhibitory neurotransmitter (Hardman and Limbird, 1996). Permetherin and pyrethrins referred to as pyrethroids are the principal over- the-counter (OTC) pediculicides available in the United States. Pyrethrums are natural compounds originating from Chrysanthemum cineriaefolium, pyrethrins are the insecticidal component of pyrethrums, and pyrethroids are synthetic, rather than naturally occurring, forms of pyrethrins (Wax and Hoffman, 1994). They affect voltage-gated sodium channels, causing delayed depolarization of the neuron by impeding sodium channel closure (Eells *et al*., 1987). Like lindane, These insecticides paralyze the louse through hyper stimulating of the nervous system, preventing it from feeding (Meinking *et al*., 2000). Permetherin is abroad- spectrum synthetic pyrethroid that works similarly to pyrethrin (Eells *et al*., 1987). Malathion (derived from Latin and Greek, meaning bad sulfur, referring to this compounds smell) is an organophosphate insecticide. In the louse malathion is converted to malaoxon, which irreversibly inhibits acetyl cholinesterase (Karunaratne and Hemingway, 2001; Zhu *et al*., 2004; Newcomb *et al*., 2005). Ivermectin causes an influx of chloride ions across neuronal membranes resulting in paralysis in many types of parasites (Ottesen and Campbell, 1994). This therapy is only pediculicidal because for lice to be exposed, they must take a blood meal that contains the drug (Taplin *et al*., 1986). Trimethoprim /sulfamethoxazole is presumed to work by ridding lice of symbiotic bacteria in their gut (Schachner, 1997). The lice presumably die from the lack of B vitamins that the bacteria synthesize (Burns, 1978). Dosing is 10 mg/kg per day based on trimethoprim (Hipolito *et al*., 2001). Given in divided doses, because the drugs half-life is 10.1 hours (Hardman and Limbird, 1996).

MATERIALS AND METHODS

A comparative study was done in the out-patient clinic in Baquba teaching hospital and the laboratory of microbiology of Diyala Medical College for the period from ten of January to the fifteen of December 2015. Seventy five females patients with pediculosis capitis included in the study, their ages ranged from 3 to 60 years. In 40 patients the pediculosis was complicated by secondary bacterial infection. The patients were divided in to three groups, each group consisted of twenty five patients. Group 1 :-The patients were treated by 5% permetherin solution applied for three successive days for 30 minutes for each application and repeated after 10 days as a single application for 30 minutes. Group 2 :- Was treated by trimethoprim /sulfamethoxazole tablet or solution according to the age (dosing is 10 mg/kg/day) for 5 days. Group 3 :- Was treated by combination of 5% permetherin solution and oral trimethoprim /sulfamethoxazole in similar does to the first and second groups. Swabs were taken from patients with bacterial infection and were cultured on different culture media and submitted to a serial of different biochemical tests for the diagnosis of type of bacteria (Collee *et al*., 1997), and the cultures were tested for the effects of 5% permetherin and trimethoprim /sulfamethoxazole by using of agar well diffusion method to evaluate their activity as antibacterial agent (NCCLS, 1997). The data were analyzed by using computer to evaluate the P value.

RESULTS

The study revealed that 23(92%) patients of the first group who was treated by 5% permetherin solution, was cleared, 20(80%) patients from the second group who was treated by oral trimethoprim / sulfamethoxazole, also cleared and all the patients in the third group 25(100%) who were treated by a mixture of 5% permetherin topically and oral trimethoprim / sulfamethoxazole were cleared (Table-1). Of those who were complicated by secondary bacterial infection 40(60%), 30(75%) the cultures shows growth of Staphylococus aureus, 6(15%) Streptococcus pyogenes and 4(10%) mixed growth of both Staph and Strep (Table-2). The cultures which were tested by 5% permetherin shows no inhibition zone but those cultures which were tested by trimethoprim /sulphamethoxazol shows significant inhibition zone, which means the permetherin solution had no antibacterial effects. The relapsing rate of the pediculosis was zero in the first and third groups, while in the second group it is 100% because the therapy was not repeated after 10 days where the nits were hatched to larva (Table-1). The comparison of the results between the three groups revealed a significant statistic difference ($p \leq 0.005$), i.e. the combination of 5%permetherin and oral trimethoprim /sulfamethoxazole was more effective than the use of each therapy alone (Table-1) and the reparation of each therapy after (8-10) days was necessary to prevent the relapse of the disease.

Table 1. Distribution of patients according to the different groups and response to therapy

Groups	Number of patients	Response to therapy		Relapse
1	25	23	92%	0
2	25	20	80%	20 100%
3	25	25	100%	0
Total	75	68	91.3%	20 26.6%

Table 2. Types of bacteria isolated from culture and effects of different types of therapy

Type of bacteria isolated	Number of samples		Effect of permetherin	Effect of Tri/Sulfa
Staphylococcus aureus	30	75%	0	25 83.3%
Streptococcus pyogenes	6	15%	0	3 50%
Mix	4	10%	0	2 50%

DISCUSSION

Our study revealed that the permetherin was ineffective as an antibacterial agent and this is the first study done on this

antiparasitic therapy, while this preparation (permetherin) was highly effective against pediculosis capitis and the relapse rate when the therapy was repeated after 8-10 days was zero. The combination therapy of permetherin and trimethoprim /sulfamethoxazole shows 100% clearance of the disease and this combination was not reported in other studies. The trimethoprim /sulfamethoxazole therapy alone was also effective to a minimal degree in comparison with permetherin and combination therapy of both and with high relapsing rate because all these therapies were not ovicidal so requiring repeation of the therapy after (8-10) days to kill the hatching larva. In comparison with other studies, the trimethoprim /sulfamethoxazole was more effective in our study (clearance rate 80%) (DiNapoli *et al*., 1988). The efficacy of permetherin in our study was coordinate with other studies (Taplin *et al*., 1986; Brandenberg *et al*., 1986; Bainbridge *et al*., 1998; Mark *et al*., 2007), while it is in coordinate with other studies done in U.S.A. and U.K., in which the parasite developed resistance to permetherin, which was not reported in our study (Meinking *et al*., 2002; Pollack *et al*., 1999; Lee *et al*., 2000; Durand *et al*., 2012).

Conclusion

It was concluded that permetherin was ineffective as antibacterial agent but it was highly effective as pediculocidal agent and it was more effective when combined with oral trimethoprim/sulfamethoxazole.

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