

# An Investigation of Efficacy of Pyrethrin+Piperonyl Butoxide (Kwell-P) to *Pediculus humanus capitis*(\*)

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## ÖZET

### *Piretrin + Piperonyl Butoksit (Kwell-P)'in Pediculus humanus capitis'e Etkisinin Araştırılması*

Bu çalışmaya İzmir-Kemalpaşa'da merkez, kasaba ve köylerde bulunan beş ilköğretim okulu ve dört ilkokulda öğrenim gören ve Aralık-1997'de yapılan araştırmada toplam 3842 öğrenciden pedikülozis kapitis saptanan 101(%16.0)'i erkek, 530(%84.0)'u kız olmak üzere 631 öğrenci alınmıştır. Tedavi sonrası ilacı uyguladığı tespit edilen 591(%93.6) öğrenciden 524(%88.7)'ünde iyileşmenin olduğu saptanmıştır.

**Anahtar kelimeler:** *Pediculus humanus capitis*, piretrin

## SUMMARY

This study was carried out on a total of 631 of 3842 students 101(16.0%) male and 530(84.0%) female) in five village and four urban primary schools in İzmir-Kemalpaşa region who were found to be infested with *Pediculus humanus capitis* (P.h.capitis) according to the findings of a survey study conducted in December-1997. It has been found that in 524(88.7%) of 591(93.6%) students who were applied the prescribed medications were cured.

**Key words:** *Pediculus humanus capitis*, pyrethrin+piperonyl butoxid

## INTRODUCTION

*Pediculus humanus capitis*(P.h.capitis) is generally seen in winter months and in cold and mild climates and has a cosmopolitan distribution. Geographical, ethnic, climatic, and hygienic conditions play an important role in the distribution of the parasite. P.h.capitis is known since prehistoric periods. It has incomplete metamorphosis and goes through all stages of development on the human skin (1,2,3,4).

The treatment of pediculosis depends on eradicating the lice through methods such as, using heat, toxic gases, insecticides, and mechanical methods. Today, using insecticides is the most common treatment method (4).

Despite the use of several insecticides, P.h.capitis infestation occurring in winter months in schools has not been completely eradicated yet. These results suggest that appropriate insecticides should have cer-

tain properties such as low toxicity, high tolerability, high effectivity and easy applicability(5).

In this study, Prethrin+Piperonyl butoxide (Kwell-P) was applied as an antiparasitic medication to 631 students infested with P.h.capitis in five village and four urban primary schools in İzmir-Kemalpaşa region in order to investigate its efficacy.

## MATERIAL AND METHODS

This study was carried out on a total of 631 of 3842 students 101(16.0%) male and 530(84.0%) female) in five village and four urban primary schools in İzmir-Kemalpaşa region who were found to be infested with *Pediculus humanus capitis* (P.h.capitis) according to the findings of a survey study conducted in December-1997. Prethrin+Piperonyl butoxide shampoo was given to students and they were informed about its application. In controls made one week later; subjects who used the medication were scanned in order to see whether they had the adults and/or eggs of the parasites and were grouped as subjects with or without parasites. For statistical analyses, SPSS V.6.0 for windows was used.

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## RESULTS

A total of 3842 students 2072(53.9%) male, 1770(64.1%) female with an age range of 5-16 in five village and four urban primary schools in İzmir-

Kemalpaşa region were examined for *P.h.capitis*. Number of students with and without parasites in primary schools that were investigated are shown in table 1.

Table 1: Schools and percentages of student with and without *P.h.capitis*.

School	Students with and without <i>P.h.capitis</i>					
	With <i>P.h.capitis</i>		Without <i>P.h.capitis</i>		Total	
	n	%	n	%	n	%
Sekiz Eylül Primary School	177	21.8	635	78.2	812	21.1
Cumhuriyet Primary School	169	17.6	792	82.4	961	25.0
Ansızca Primary School	21	21.4	77	78.6	98	2.6
Sütçüler Primary School	32	8.6	341	91.4	373	9.7
Atatürk Primary School	94	10.7	787	89.3	881	22.9
Kızılüzüm Primary School	20	30.3	46	69.7	66	1.7
Ulucak Primary School	92	17.6	430	82.4	522	13.6
Damlacık Primary School	6	7.7	72	92.3	78	2.0
Kuyucak Primary School	20	39.2	31	60.8	51	1.3
<b>Total</b>	<b>631</b>	<b>16.4</b>	<b>3211</b>	<b>83.6</b>	<b>3842</b>	<b>100.0</b>

$X^2=91.2, p<0.05$

Table 2: Percentage of *P.h.capitis* according to gender.

Gender	<i>P. h. c a p i t i s</i>					
	With <i>P.h.capitis</i>		without <i>P.h.capitis</i>		Total	
	n	%	n	%	n	%
Male	101	4.9	1971	95.1	2072	53.9
Female	530	29.9	1240	70.1	1770	46.1
<b>Total</b>	<b>631</b>	<b>16.4</b>	<b>3211</b>	<b>83.6</b>	<b>3842</b>	<b>100.0</b>

$[X^2(\text{correcting to Yates})= 435.2, p<0.05]$

Table 3. Students numbers and percent that applied medication

Control	n	%
Absent in controls	7	1.1
Not applied medication	33	5.2
Applied medication	591	93.6
<b>Total</b>	<b>631</b>	<b>100.0</b>

Table 4: The occurrence of *P.h.capitis* in medication users.

In control <i>P.h.capitis</i>	n	%
with <i>P.h.capitis</i>	67	11.3
without <i>P.h.capitis</i>	524	88.7
<b>Total</b>	<b>591</b>	<b>100.0</b>

Results indicate that out of 3842 students 101 of 2072 male students (4.9%) and 530 of 1770 female students (29.9%) were found to be infested with *P.h.capitis* (Table 2).

The percentage female students infected with pediculosis (29.9%) is found to be significantly greater than their male counterparts (4.9%). Thus, the results indicate a statistically significant difference caused by gender in infestation of *P.h.capitis* [ $X^2(\text{correcting to Yates})= 435.2, p<0.05$ ].

Table5. Researchers, insecticides used, and their results for the treatment of pediculosis capitis (6,8).

Researcher	Medication used							
	%1 Permetrin		%1 Lindane		Pirethrin(Lotion)		Pirethrin(shampoo)	
	n	%	n	%	n	%	n	%
Taplin et al(86)	28/29	97	13/30	43	-	-	-	-
Brandenburg et al(86)	255/257	99	214/251	85	-	-	-	-
Bowerman et al(87)	639/652	98	283/380	74	-	-	-	-
Taplin-Meinking(87)	30/32	94	-	-	10/33	30	4/33	12
DiNapoli et al (88)	197/203	97	-	-	119/189	63	-	-
Carson et al (88)	27/27	100	-	-	-	-	29/32	93.5

591 of 631 students who were given Kwell-P and were informed about its application used the medication (table 3).

It was found that, 524(88.7%) of 591(93.6%) students who applied the medication were cured (Table 4).

## DISCUSSION

Pyrethrins are naturally obtained pesticides that have an effect on the central nervous system ectoparasites of which results in death caused by paralysis. Piperonyl butoxide kills the ectoparasite by inhibiting some hydraulic enzymes which play a role their metabolisms. Because of their synergetic effects, piperonyl butoxide is used with pyrethrins. Previous research has indicated that the ovosid effect increases if alcohol is added to the formula (6,7,8,9).

The insecticidal effect of flowers which belong to *Chrysanthemum* genus have been known for centuries. Although it is not exactly known where it was used for the first time, it is suggested that it might have been used in Persian region, today's Iran (6).

Pyrethrins are the active insecticidal components of pyrethrum (10). Pyrethrins are generally used as a pediculocid by formulating with an adjuvant such as piperonyl butoxide. An adjuvant gains increased pharmacologic or toxic effect of active substance when they are mixed (11).

There seems to be only a few studies on Pyrethrins+Piperonyl butoxide compound used for the treatment of pediculosis capitis. It has been shown that, many researchers have used different compounds and obtained different results for the treatment of pediculosis capitis (Table 5).

A comparative study have been made about the treatment of P.h.capitis in 1996 by Budak, et al. (5) They obtained effective results with 1% Lindane(67.5%) and 0.4% Sumitrin(1%) which showed that the first medication was more effective than the other.

An investigation was made by Carson et al. with NIX cream containing permethrine and RID shampoo (combination of Prethrin+Piperonyl butoxide)

and determined that they were 100% and 93.5% effective respectively (8).

In our investigation it has been shown that, Kwell-P was effective in 524(88.7%) of 591 students (Table 4). This finding is different than the finding of Taplin et al who obtained 12%, and is similar to that of Carson et al who found 93.5% effectiveness.

As a result, it is suggested that pyrethrine+piperonyl butoxide(Kwell-P) compound be used for the treatment of pediculosis capitis which has been a serious public health problem for centuries. Given the fact that it has less toxic effect than many other insecticides and is somewhat less expensive, Kwell-P is a more appropriate medication than the others for the treatment of pediculosis capitis.

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