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Prevalence of *Pediculus humanus capitis* in Some School Children of Taegu City, Korea*

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=國文秒錄=

大邱市內 學童들에 있어서 머릿니 感染狀

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大邱市內 學童들에 있어서 머릿니의 感染狀을 알아보기위해 1989年 9月부터 1990年 6月까지 大邱市內 3個學校 學童과 農村地域 1個學校 學童을 調査對象으로 選定하여 肉眼으로 서캐의 有無를 調査하였다.

서캐가 發見되는 學童은 참빗으로 머리를 3分間 빗겨서 成蟲을 調査하였으며, 雌雄의 鑑別은 Nuttal 및 Keilin 法에 依據하였다.

總 被檢者 2,082名中 머릿니 感染率은 15.0%이었으며, 性別로는 男學生은 5.3%, 女學生은 25.0%이었으며, 男女間의 有意的差를 認定할 수 있었다.

年令群別 感染率에 있어서 女學生의 경우, 9歲群에서는 最高値 32.1%를, 14歲群에서는 最低値 7.3%를 나타내었으며, 年令이 增加할수록 그 率은 減少하였다.

男學生의 경우에는 8歲群에서 最高値 8.5%를, 12歲群에서 最低値 1.0%를 나타내었으며, 年令群別 뚜렷한 差를 認定할 수 없었다. 都市 學童들에 있어서 머릿니 感染率은 男學生에서는 4.8%, 女學生에서는 24.9%이었는데 反하여, 農村學童들에 있어서는 男學生은 11.0%, 女學生은 43.5%로 比較的 높았으며, 都市와 農村의 女學生에서는 有意的差를 認定할 수 있었으나, 男學生에서는 認定할 수 없었다.

以上의 成績으로 미루어보아 大邱市內 學童들에 있어서 머릿니 感染率은 아직도 高率임을 알수 있었다.

Key Words: Head lice, *Pediculus humanus capitis, Prevalence,* Taegu city.

Introduction

The head louse, *Pediculus humanus capitis* De Geer(Anoplura; Pediculidae) is a cosmopolitan distributed obligate ectoparasite which causes irritating dermatitis, annoyance and blood loss, apart from social and psychological distress.

Reports of the prevalence of head lice among school children in both developed and developing countries have been published by many investigators (Buxton, 1938 Chao et al., 1981; Donaldson, 1976; Grainger, 1980; Kwaku-Kpikpi, 1982; Maguire and McNally, 1972; Ogunrinade and Oyejide, 1984; Petrelli et al., 1980; Sinniah et al., 1981 and 1983; Slonka et al., 1977; and Suleman and Fatima, 1988), but

* The results of this study were presented at the 32th annual meeting of the Korean Society for Parasitology in 1990.

only a few studies of this parasite in Korean have been reported(Kim et al., 1984; Lee et al., 1984; Pak, 1986; Pai and Huh, 1987; Huh et al., 1988; and Pai et al., 1989a, b, c).

Lee et al.(1984) made a survey of head lice infestations based on discovery of adult worms and/or their nits on scalp and hairs among primary school children in Seosan gun, Chungnam Province, and reported that the overall positive rate of head lice was 73.5 per cent.

From their studies of head lice infestation among school children in Mungyong-gun, Kyungpook Province, Pai and Huh(1987) reported that the prevalence of *P. humanus capitis* was found to be high, and the difference in the rate of infestation between boys and girls was significant.

Quite recently, Pai et al.(1989a) conducted an epidemiological study of head lice among children in rural areas of Korea, and reported the prevalence of head lice was relatively high, being 69.5 per cent by the identification of the adult worms and/or their nits on the hairs.

As a result, the overall positive rate of *P. humanus capitis* among school children is estimated to be more than 60.0 per cent and human pediculosis is recognized as a major public health problem in the urban and rural areas of Korea today.

However, few reports on the infestation of head lice among school children in Taegu city and surrounding counties have been available.

This study was carried out to estimate the prevalence of pediculosis among the school children of Taegu city and one surrounding county, and to determine if there were any differences in the prevalence of infestation according to age, sex, area and social background.

Materials and Methods

Schools surveyed: During the period from September, 1989 to May, 1990, the prevalenc of head lice infestation was studied among school children in Taegu, and children in the vicinity of Taegu city.

The survey included four schools, three in Taegu city-Yeongseon primary school, Seongseo middle school and Chungri girl middle school; one in Kyungju county-Ipsil primary school.

Particulars of the schools and samples studied at different schools are summarized in Table 1.

Pertinent data on each child regarding sex, age and grade were obtained prior to the survey. All of the children tested were between the ages of 6 and 14 years.

The proportion of children tested out of the total number varied from 15.5 per cent to 97.8 per cent, with an average of 30.0 per cent. The sex distribution of the children was almost equal.

Examination for lice and nits: Each children was first examined for nits by visual inspection of the hair and scalp in the open or in a brightly lit room.

Table 1. Total number of school children and number tested from different schools surveyed for head lice infestation(1989-1990)

School	Locality	Total No. of children	Number tested	Percent tested
Primary School				
Yeong-seon	Taegu city	2,606	891(457-434)*	34.2
Ip-sil	Kyungju-gun	550	538(283-255)	97.8
Middle School				
Seong-seo	Taegu city	2,038	316(316- 0)	15.5
Chung-ri	Taegu city	1,746	337(0-337)	19.3
Total		6,940	2,082(1,056-1,026)	30.0

* Figures in parentheses indicate breakdown by sex(boys-girls)

All children positive for nits were then examined for adult lice by undirectional combing of the hair with a fine-toothed bamboo comb for about 3 minutes onto a white paper.

Any lice recovered were counted and killed by transferring into 70 per cent ethyl alcohol.

The identification of adults obtained by combing hair was made according to the method of Nuttal and Keilin(1930).

Statistical analysis: The chi-square test was used for comparison of prevalence rates among different age, sex and locality. For combining several 2×2 tables the method proposed by Cochran(1954) was used.

Results

The prevalence of head lice infestation among boys and girls in the four different schools, based on the discovery of adult worms and/or their nits, is presented in Table 2.

The prevalence rates of different schools varied

Table 2. Prevalence of head lice infestation among primary and middle school children in four different schools (1989-1990)

Shool	Boys		Girls		Total	
	No. examined	Percent positive	No. examined	Percent positive	No. examined	Percent positive
Primary school						
Yeong-seon	457	4.8	434	24.9	891	14.6
Ip-sil	283	11.0	255	43.5	538	26.4
Middle School						
Seong-seo	316	0.9	–	–	316	0.9
Chung-ri	–	–	377	11.3	337	11.3
Total	1,056	5.3	1,026	25.0	2,082	15.0

Table 3. Comparison of age specific prevalences of head lice infestation in boys and girls of Taegu-city based on pooled data from three schools(1989-1990)

Age (Year)	Boys			Girls			X^2 - value
	No. examined	No. infested	Percent infested	No. examined	No. infested	Percent infested	
6	81	4	4.9	67	16	23.9	9.69*
7	78	1	1.3	68	15	22.1	14.23*
8	71	6	8.5	72	22	30.6	9.73*
9	72	1	1.4	81	26	32.1	22.32*
10	70	4	5.7	58	14	24.1	7.45*
11	74	5	6.8	81	15	18.5	3.77^{ns}
12	105	1	1.0	111	21	18.9	17.49*
13	85	1	1.2	123	9	7.3	2.81^{ns}
14	133	2	1.5	110	8	7.3	3.59^{ns}
Total	773	25	3.2	771	146	18.9	

ns: Difference not significant($P>0.05$)
*Difference significant($P<0.05$)

from 0.9 per cent to 26.4 per cent. In Ipsil primary school, 26.4 per cent of the 538 children showed postive, whereas, only 0.9 per cent of 316 Seongseo middle school children examined were found to be positive.

In Yeongseon primary school and Chungri girl middle school, however, the rate for the lice was 14.6 per cent and 11.3 per cent, respectively.

The sex-specific rates of prevalence based on pooled data from the four school were higher in girls than in boys; 25.0 per cent in girls and 5.3 per cent in boys, respectively.

The comparison of age-specific prevalence by sex based on pooled data from three schools in Taegu city is shown in Table 3.

The prevalence rates varied from 1.0 per cent to 8.5 per cent in boys and 7.3 per cent to 32.1 per cent in girls, with maximum infestation in boys in the 8 year age group and in girls in the 9 year age group, respectively.

The age-specific rates were higher in girls than in boys and the difference was significant in all but the three age groups(11, 13 and 14 years).

Figure I illustrates the prevalence of head lice infestation among school children by age and sex.

The prevalence of head lice in girls decreased as a linear function of age, and the rate of decrease with age observed.

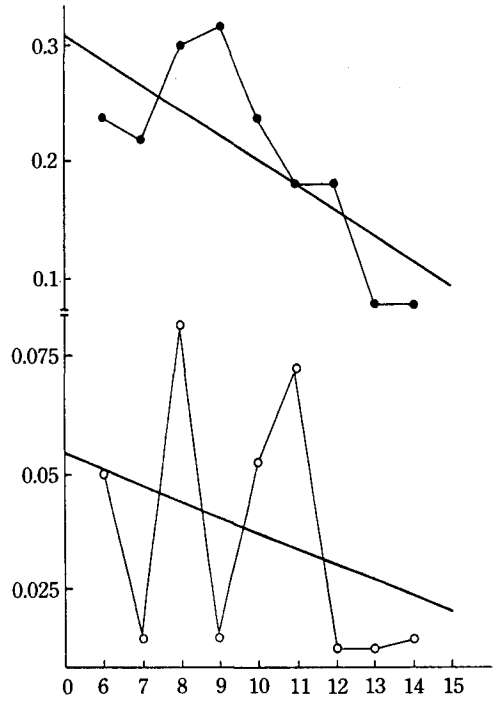

Fig 1. Prevalence of head lice infestation among school children by age and sex. Straight lines are the fitted regression lines
Girls: $Y=0.452-0.2463x$, ($p<0.05$), $r^2=0.589$
Boys: $Y=0.075-0.0391x$, ($p>0.05$), $r^2=0.137$
The two slopes are significantly different($p<0.05$)
(●)Girls; (○)Boys.

Comparison of the regression slopes revealed that the slope for girls was significantly greater than for

Table 4. Comparison of pediculosis prevalences among urban and rural primary school children by grade and sex(1989-1990)

Grade	Boys					Girls				
	No. examined		Percent infested		X^2 - value	No. examined		Percent infested		X^2 - value
	Urban	Rural	Urban	Rural		Urban	Rural	Urban	Rural	
1	81	36	4.9	5.6	0.35	67	27	23.9	29.6	0.70
2	78	43	1.3	4.7	3.06	68	53	22.1	37.3	4.24*
3	71	43	8.5	13.9	1.54	72	50	30.6	54.0	7.75*
4	74	48	1.4	20.8	15.90*	82	37	31.7	51.4	5.06*
5	76	53	6.6	13.2	2.50	69	47	21.7	48.9	10.66*
6	77	60	6.5	6.7	0.15	76	41	18.4	34.1	4.53*
Total	457	283	4.8	11.0		434	255	24.9	43.5	

*Difference significant($P<0.05$)

the boys, implying that prevalence of lice decreased with age more rapidly in girls than in boys.

Table 4 shows the comparison of pediculosis prevalences among urban and rural primary school children by grade and sex.

Rural school children show a higher prevalence of head lice than similar children from urban schools although the number of examinations was insufficiently large.

In the urban area, of 457 boys and 434 girls examined, 4.8 per cent and 24.9 per cent infested the head lice, respectively.

In the rural area, 11.0 per cent of 283 boys and 43.5 per cent of 255 girls examined showed the lice. There was no apparent significant difference in prevalence rates between urban and rural school boys in any grade except the 4th grade. However, the prevalences were higher in rural schoolgirls than in urban ones and the difference was significant in all but the one youngest age group (1st grade).

Table 5 shows the relative estimate for intensity of head lice infestations by combing hairs among 272 nits positive cases.

In most of the infested heads the relative intensity remained very low.

In 98.2 per cent of the cases, the number of head per 3 minute search was zero. While, higher value of five, eight and nine accounted for only 1.2 per cent of the cases. Sexing of louse specimens gave 15 females and 7 males.

Table 5. Relative estimate for intensity of infestation by combing hair among 272 positive nit cases(1989-1990)

No. of lice/ 3 min. search	No. of head	Percent of total
0	269	98.9
1	–	–
2	–	–
3	–	–
4	–	–
5	1	0.4
6	–	–
7	–	–
8	1	0.4
9	1	0.4

Discussion

Of the many kinds of blood-sucking insects and arthropods which bite people, cause annoyance and skin reactions, and traumatic disease, lice have been known as the most closely associated with human beings since before prehistoric times.

Reviewing the literature on human lice in Korea, Hurlbut et al.(1952) made a survey of resistance in Korean body lice, and reported for the first time that the body lice was DDT resistant. They also commented that a degree of resistance existed which rendered DDT no longer effective as a delousing agent. Upon further investigation it was observed that these lice were not resistant to other chlorinated hydrocarbon insecticides which had not previously been used in Korea(Eddy, 1952).

The Korean government stopped the import of DDT in 1959 because the Korean people complained that insects and other arthropods of medical importance were not killed after DDT spraying operations.

Thereafter, malathion was introduced into Korea as a substitute for DDT, and other organophosphorus compounds have also been imported for medical and/or agricultural pest control.

As a result, vigorous countermeasures supplemented by the new insecticides substantially reduced human lice incidence.

However, in recent years a substantial increase in the prevalence of pediculosis has been reported from some rural and urban areas of Korea(Lee et al., 1984; Kim et al., 1984; Pai and Huh, 1987; Pai et al., 1989a, b, c).

In the previous report by Lee et al.(1984) *P. humanus capitis* was found in 78.8 per cent in girls examined, while in boys only 67.6 per cent were found infested. The total number examined in their study was 615 and the overall infestation rate was 73.5 per cent.

In another survey done by Pai and Huh(1987), higher results were reported; the infestation rate for *P. humanus capitis* among girls was 91.9 per cent

88.9 per cent among boys in a rural area.

Results from this study indicate that, of 1,544 urban school children and 538 rural children, 11.1 per cent and 26.4 per cent had positive findings by discovery of adults and/or their nits on scalp and hairs, respectively.

Actually, this is no indication of the true prevalence among the children in Taegu and its surrounding county, because the individuals in the present study are not adjusted for the proportion of the children belonging to each age, sex, and socioeconomic background.

However, the results are quite comparable with earlier reports based on discovery of adults and/or their nits by visual inspection and combing of the hair with a fine-toothed comb.

As shown in Table 6, it is noted that, although higher prevalences are expected if the number of examination is sufficiently large, the present results are not high if compared with prevalences of other surveys for head lice in urban and rural school children of Korea.

The sex specific rate of *P. humanus capitis*, with the prevalence significantly higher in girls than in boys, is in agreement with previous findings(Buxton, 1938; Chunge, 1986; Donaldson, 1976; Jalayer, 1967; Kim et al., 1984; Lee et al., 1984; Maguire and McNally, 1972; Pai and Huh, 1987; Pai et al., 1989a, b; and Petrelli et al., 1980).

Likewise, the prevalence being higher and lower rate in its decrease with age among girls may be because girls have long hair.

As Suleman and Fatima(1988) indicated, long hair may not be washed as frequently and thoroughly as short hair, and may serve as a predisposing factor for pediculosis.

A study of Busvine and Reid(1949) mentioned that head lice were less prevalent among Chinese because of the latter's habit of keeping their children's head hair cut short.

Such consideration was also recognized by Sinniah et al.(1981) and Sinniah et al.(1983) in Malaysia, Kwaku-Kpikpi(1982) in Ghana and Chunge(1986) in Kenya, but Slonka et al.(1976) and Slonka et al.(1977) in USA suggested that hair length was not related to the prevalence of head lice.

The age specific rate of infestation was higher in girls than in boys in the present study and the diffe-

Table 6. The reported prevalences of head lice infestation among school children in Korea.

Source	Locality	No. tested	Prevalence(%)	Group tested
Lee et al. (1984)	Seosan (Rural)	615	73.5	Primary school children
Kim et al. (1984)	Yeongyang (Rural)	5,937	44.5	Primary and middle school children
Pai and Huh (1987)	Mungyung (Rural)	386	91.9	Pre-school and primary school children
Pai et al. (1989)	Seoul (Urban)	7,937	13.8	Pre-school, primary and middle school children
Pai et al. (1989)	Seoul (Urban)	2,752	15.1	Middle girl school children
Authors (1990)	Taegu (Urban)	1,544	11.1	Primary and middle school children
	Kyungju (Rural)	538	26.4	

rence was significant in all age group.

As shown in Figure 1, comparison of the regression slopes revealed that the slope(b=-0.0391) for boys was significantly less than for the girls(b=-0.2463), implying that prevalence of head lice decreased with age more slowly in boys than in girls.

In previous studies regarding the relationship between age and head lice infestation among school children, Maguire and Mc Nally(1972) in Ireland, and Kwaku-Kpikpi(1982) in Ghana, Sinniah et al.(1983) in Malaysia, and Suleman and Fatima(1988) in Pakistan noticed infestation rates changing with age, with peak prevalence in the 8-10 year age groups, but Slonka et al.(1977) in USA and Sinniah et al.(1981) in Malaysia noted no relationship.

In the present study, a total of 1,429 school children from urban and rural schools were examined, and the overall prevalence rate for *P. humanus capitis* was found to be 19.0 per cent with significant difference in the incidence of infestation between urban and rural areas. Similar results were obtained by Pai et al.(1989b).

These findings indicate that the infestation rate for head lice is now much less prevalent as compared with those in previous reports, and that pediculosis remains a health problem among children of Taegu city and its surrounding counties.

This is the first report on pediculosis among some school children in Taegu city. Though it is difficult to generalize for the whole city, one can safely conclude that lice infestation among school children is very high, the eradication and prevention of this parasitic disease seem to be possible with chemotherapeutic effect of specific drugs in combination with extensive public health education and improvement of personal hygiene, with particular attenion to the girls.

Summary

In order to determine the prevalence of *Pediculus humanus capitis* infections among school children in Taegu city and one surrounding county, a survey based on discovery of adult worms and/or their nits by visual inspection and combing of the head were conducted during the period from September 1989 to May 1990.

A total of 2,082 children aged 6-14 years from four schools revealed an overall prevalence of 15.0 per cent, with girls showing a higher infestation than the boys; 25.0 per cent in girls and 5.3 per cent in boys.

The infestation rate for head lice by age groups varied from 1.0 per cent to 8.5 per cent in schoolboys and 7.3 to 32.1 per cent in schoolgirls, respectively.

In the schoolgirls, the prevalence decreased as a linear function of age and the rate of decrease with age was observed. In boys however it was not observed.

There was a significant difference in the infestation rate of head lice between urban and rural school girls; 24.9 per cent in urban and 43.5 per cent in rural girls, while in boys there was no significant difference between urban and rural areas.

It was found that the infestation rate of *Pediculus humanus capitis* among the school children of Taegu city is relatively high.

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