

# Epidemiology Study of the Head Lice *Pediculus humanus capitis* Isolated among Primary School Students in Erbil city, Kurdistan Region, Iraq

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## Abstract

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**Background:** The association between man and the head lice is one of the oldest relationships and its history returns to 10,000 years ago. Blood-sucking head lice belong to Kingdom Animalia, Class: Insecta, Order: Phlebotomina, Family: Pediculidae, Genus: *Pediculus*, Species: *humanus* and Subspecies: *capitis* that's an obligate parasite on humans. This highly specialized parasite feeds on blood and has a close association with its host where it completes its entire life cycle.

**Objective:** To determine the rate of infestation by the head lice, *Pediculus humanus capitis* and its associated factors among primary school children in Erbil City.

**Patients and Methods:** A case-control study was conducted on the twenty-two (22) randomly selected primary schools in the center of Erbil city. For this purpose, a total of 1082 students (430 boys and 652 girls) were examined from first to sixth grade (age  $\geq 6$  years old) during 1<sup>st</sup> October 2020 to 31<sup>st</sup> May 2021. Personal requested information was recorded by student parents in a questionnaire form.

**Results:** An overall prevalence of infestation of 25.5% (276/1082) was recorded in the present study. The study reveals the existence of a significant relationship with age [6 and < 9 years old, 178/759 (23.5%), and  $\geq 9$  years old, 98/323 (30.3%),  $P = 0.0174$ ], gender [girls, 215/652 (33%) and boys, 61/430 (14.2%),  $P < 0.001$ ], education level of parent (educated family, 146/694 (21%) and non-educated family, 130/388 (33.5%),  $P < 0.001$ ], longevity of hair [long hair, 157/473 (33.2%) and short hair 119/609 (19.5%),  $P < 0.001$ ], hair washing frequency [daily washing, 243/587 (41.4%), and weekly washing 33/495 (6.7%),  $P < 0.001$ ], hair combing condition [common comb user, 165/499 (33%) and special comb user, 111/583 (19%),  $P < 0.001$ ] and sleeping habitat [sleeping together 222/693 (32%) and sleeping habitat alone, 54/389 (13.9%),  $P < 0.001$ ]. There's no significant existence related to density of students in classroom [one student per table, 114/486 (23.5%) and

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**Website:** <https://djm.uodiyala.edu.iq/index.php/djm>

**Received:** 8 November 2021

**Accepted:** 28 December 2021

**Published:** 25 April 2022

sitting in pair, 162/596 (27.2%),  $P = 0.1621$ ], hair type, smooth and wrinkle [smooth hair, 183/741 (24.7%), 93/341 (27.3),  $P = 0.366$ ] and head lice infestation.

**Conclusion:** We concluded that head lice infestation rate was varied depending on the several physio and socioeconomic factors including, age, gender, type of hair, education level of parents, frequency of hair washing, sleeping habitat and condition of hair combing. Among variables, only density of pupils in classroom, smooth and wrinkled hair show no any significant relationship with pediculosis capitis ( $P$ - value = 0.1621 and  $P$  – value = 0.366 respectively).

**Keywords:** *Pediculus humanus capitis*; Pediculosis; Head lice; Epidemiology; Erbil

## Introduction

The association between man and the head lice is one of the oldest relationship and its history return to 10000 years ago [1]. Blood sucking head lice belong to Kingdom Animalia, Class: Insecta, Order: Phiroptera, Family: Pediculidae, Genus: *Pediculus*, Species: *humanus* and Subspecies: *capitis* that's obligate parasite on human this highly specialized to suck blood and close association with their host where completed its entire life cycle [2].

In spite of the fact that invasion by this parasite does not cause a serious wellbeing issue, it could be an individual and open wellbeing burden physically, mentally, and socially [3] and the most common health related in early 6-12 aged group children with the intensive of the scalp is the main clinical symptoms of this parasite in addition initiate of secondary infection by various other microorganism that caused due to head lice biting as described by Madke and Khopkar [4]. It is reported that's common among children (3-11) years old [5]. World Health Organization specified that the vector-borne infections account for more than 17% of all irresistible illnesses, causing more than 700 000 passing every year and it can be caused by either parasites, microscopic

organisms or virus It is mentioned that the lice among vector that can transmit typhus and louse borne relapsing fever [6].

It was deemed necessary to refer to the research of a systemic review and meta-analysis of the past fifty years ago which had been done on the head lice among primary school pupils worldwide by Hatam-Nahavandi. [7]. They mentioned that overall prevalence of infestation estimate as %19. Because of every healthy area depend on healthy education system especially healthy lecturer who educate our offspring and give rise a healthy society, so its need to study such field in order to control overall item related to human health [8]. Aim of this study is to determine the rate of infestation by head lice among primary school children and identify main causes and factors associated with the head lice infestation rate.

## Patients and Methods

### Description of the study area

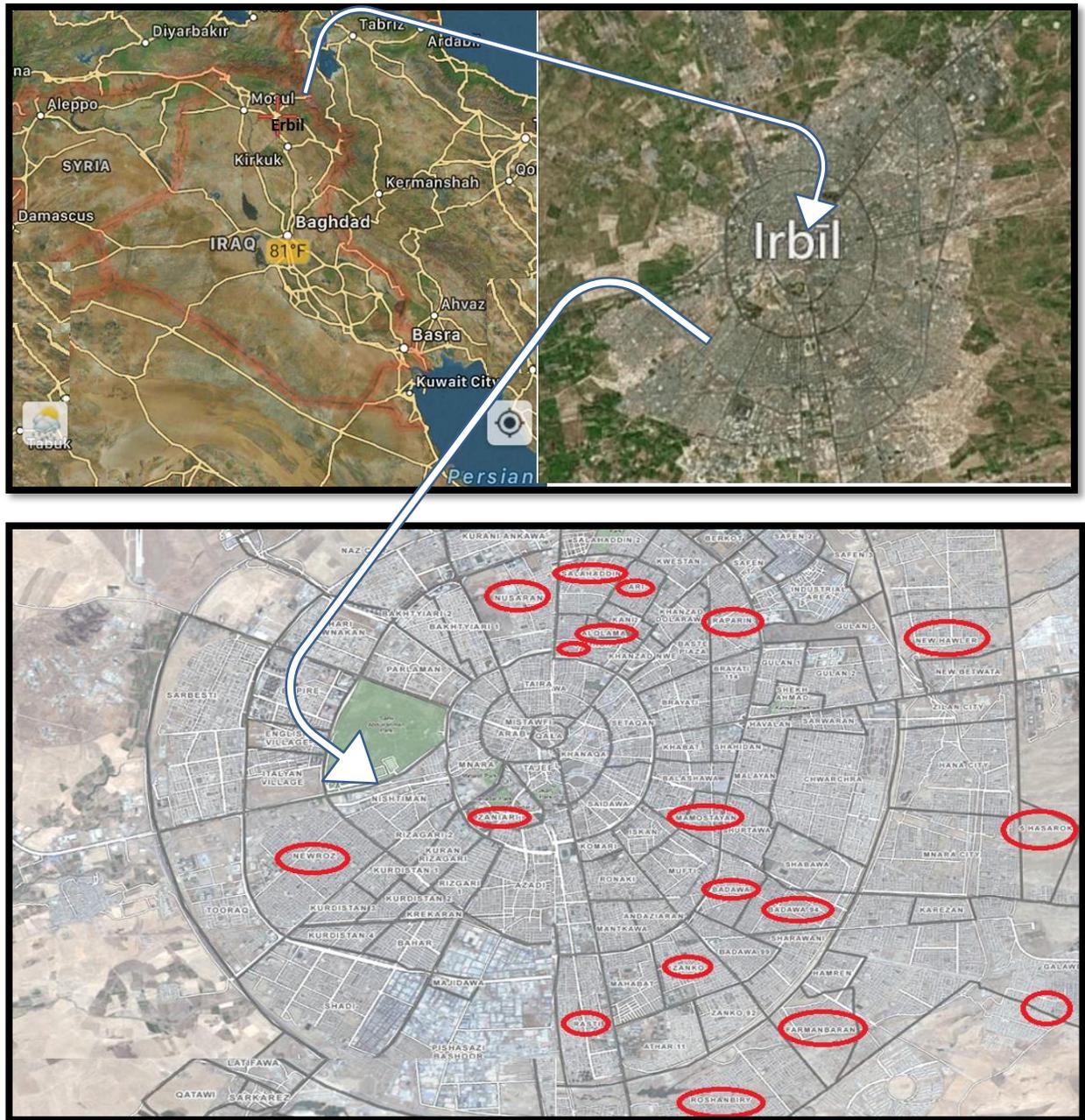
According to the record that existed in the directorate of education, 260 basic schools available in the centre of Erbil city which are distributed over 60 quarters Figure (1). Erbil City located in Kurdistan Region, northern of Iraq (the latitude of 36.206293, and the longitude is 44.008870 with the GPS

coordinates of 36° 12' 22.6548" N and 44° 0' 31.932" E).

### **Research design and sample collection procedure**

A case control study was conducted on the twenty two (22) randomly selected primary school in the center of Erbil city which are different in terms of social and financial level. During this study, one thousand and eighty two (1082) students (430 boys and 652 girls) were examined from first to sixth stage (age  $\geq 6$  years old) during 1<sup>st</sup> October 2020 to 31<sup>th</sup> May 2021.

This study was conducted in most prevalent period of head lice as performed by Tawfeeq[9]. Personal requested information was recorded by student parents in all the primary school. Children who returned the questionnaires were arranged, then hair was examined for the adult lice, as well as for nits, by full-head observation. The scalp and around the ears and at the base of the neck were inspected with the utilize of mobile phone light and a handled amplifying lens was used. A student was considered as positive case in the event that live lice or nits were found.



**Figure (1):** Satellite view of the origin maps of the study area included map of Erbil city shown location of sampling among primary school in different Erbil Quarter ([https://satellites.pro/Iraq\\_map#36.090441,44.001285,11](https://satellites.pro/Iraq_map#36.090441,44.001285,11))

### Statistical Analysis

According to Rutterford *et al.* [10] and Dagne *et al.* [11] the general formula  $n = [Z^2 * p (1 - p)]/e^2$  was used to determine the sample size,  $p =$  standard of division = 0.50

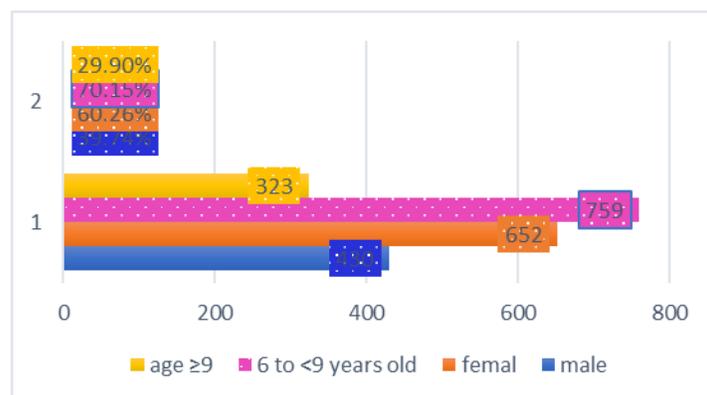
and a value of 0.05 (margins of error) was selected as the satisfactory restrain of exactness at 95% confidence intervals (CI) where Z-score = 1.96 as analyzed by Hazra [12]. The minimum sample size was found to

be 384 but to make easy to count more than this number, 1082 student were obtained as the sample size. Data investigation was analyzed using STATA software program version Stata/12. The significance of difference among prevalence values was calculated utilizing the Chi-squared test. P-value  $\leq 0.05$  considers as a scale level of significance.

### Results

The total From a total of 22 essential school children, 1082 students were observed for the head lice in their hair. The number of girls respondents are higher 652 (60.26%) than the number of boys 430 (39.74%). The average age of participants was 9.5 years old (Standard deviation, SD = 0.013). The highest number of responded pupils was between 6 and > 9 years old (70.15%, 759/1082) unlike those between the age  $\geq 9$  years old, the rate of participation and response was lower (29.9%, 323/1082 pupils). In the current study, an overall prevalence of infestation was recorded as 25.5% (276/1082) as mentioned in Figure (2) and Table (1). Study reveals the existence of

a significant relationship age [6 and < 9 years old , 178/759 (23.5%), and  $\geq 9$  years old, 98/323 (30.3%), P = 0.0174], gender [girls, 215/652 (33%) and boys, 61/430 (14.2%), P < 0.001], education level of parent (educated family, 146/694 (21%) and none educated family, 130/388 (33.5%), P < 0.001], longevity of hair [ long hair, 157/473 (33.2%) and short hair 119/609 (19.5%), P < 0.001] hair washing frequency [daily washing, 243/587 (41.4%), and weekly washing 33/495 (6.7%), P < 0.001], hair combing condition [common comb user,165/499 (33%) and special comb user, 111/583 (19%), P < 0.001] and sleeping habitat [ sleeping together 222/693 (32%) and sleeping habitat alone, 54/389 (13.9%), P < 0.001]. There's no significant existence related to density of students in classroom [ one student per table, 114/486 (23.5%) and sitting in pair, 162/596 (27.2%), P = 0.1621], hair type, smooth and wrinkle [smooth hair, 183/741 (24.7%), 93/341 (27.3), P = 0.366] and head lice infestation. Table (2) and Figure (3 and 4).



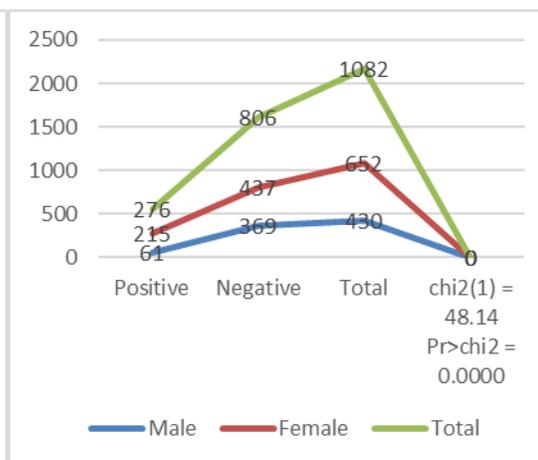
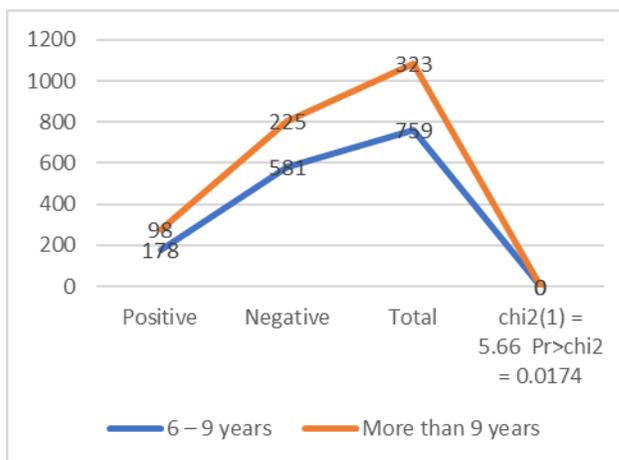
**Figure (2):** Histogram summarize total number of participants according to gender and age groups

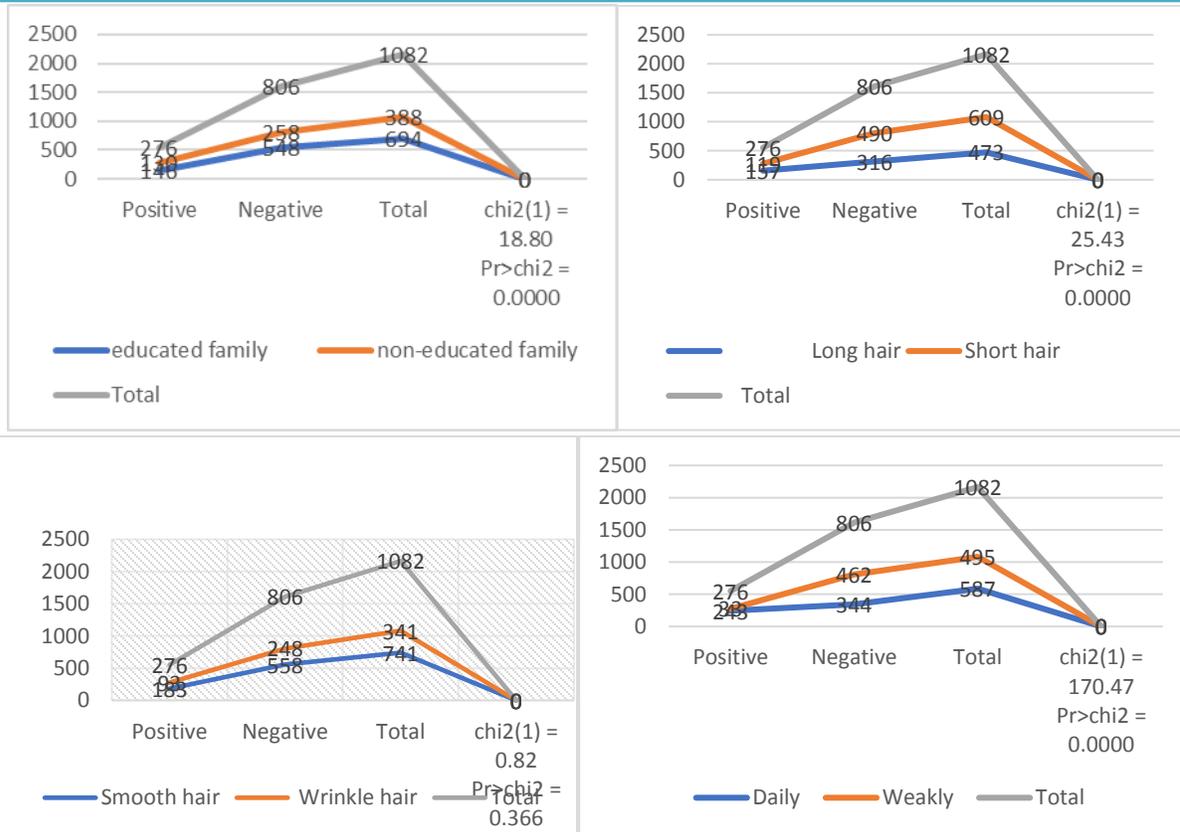
**Table (1):** Overall percentage of infestation by *Pediculus humanus capitis* among randomly selected primary school in Erbil city

Name of schools	Number of examined student	Total Positive cases	Prevalence of infestation
Payan Basic School	50	22	44%
Zhyari Hawree Basic School	50	13	26%
Chray Znst Basic School	50	8	16%
Roshenbery Basic School	50	4	8%
Mustafa Shahban Basic School	54	20	37%
Peshkawtn Basic School	50	18	36%
Haval Basic School	50	20	40%
Aq-Quinlo Basic School	50	4	8%
Furrat Basic School	50	22	44%
Zmnako Basic School	50	2	4%
Piramerd Basic School	50	11	22%
Havin Basic School	80	5	6.30%
Zanko Basic School	27	3	11%
Altun Basic School	51	8	15.70%
Sakar Basic School	50	19	38%
Pers Basic School	50	13	26%
Zhekaf Basic School	62	6	9.70%
Korak Basic School	30	12	43.30%
Gohdar Basic School	20	6	30%
Peshraw Basic School	58	10	17.20%
Rwbar Basic School	50	21	42%
Hendreen Basic School	50	29	58%
<b>Total (standard deviation, SD = 0.013)</b>	<b>1082</b>	<b>276</b>	<b>25.5% (276/1082)</b>

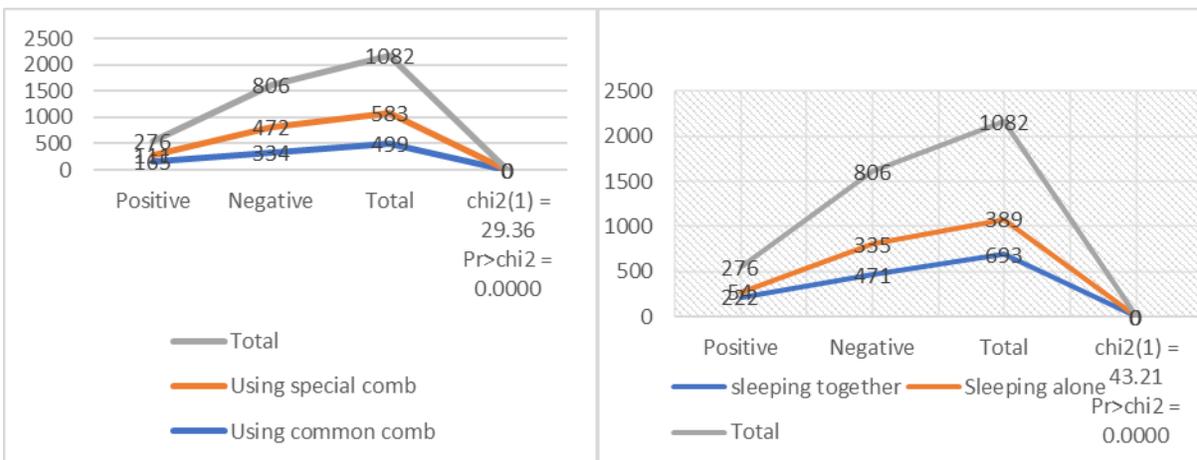
**Table (2):** Head lice infestation and its associated variables among primary school children in Erbil city

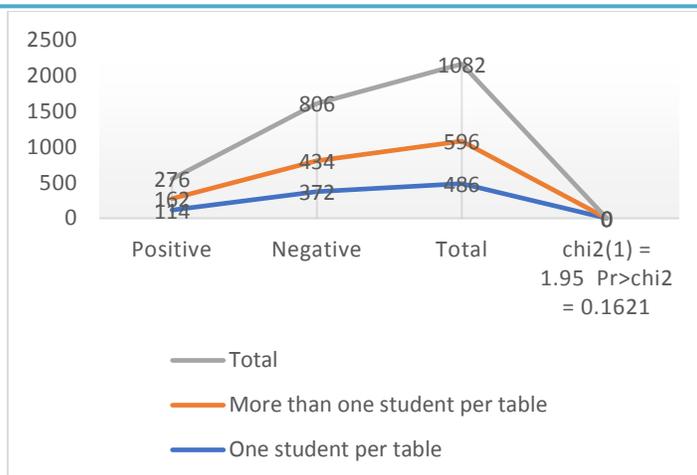
Variables		Total Sample	Total Positive n (%)	Chi-square	P-Value
Age	between 6 and <9 years	759	178 (23.5)	5.66	0.0174
	≥ 9 years old	323	98 (30.3)		
Gender	Male	430	61 (14.2)	48.14	< 0.001
	Female	652	215 (33)		
Education levels of parent	Educated	694	146 (21)	18.8	< 0.001
	None educated	388	130 (33.5)		
Hair longevity	Long	473	157 (33.2)	25.43	< 0.001
	Short	609	119 (19.5)		
Types of hair	Smooth	741	183 (24.7)	0.82	0.366
	Wrinkle	341	93 (27.3)		
Daily hair hygiene	Daily	587	243 (41.4)	170.47	< 0.001
	Weekly	495	33 (6.7)		
Individuality of used comb	Using common comb	499	165 (33)	29.36	< 0.001
	Using special comb	583	111 (19)		
Sleeping habitat	Sleeping alone	693	222 (32)	43.21	< 0.001
	Sleeping together	389	54 (13.9)		
Classroom habitat	one student per table	486	114 (23.5)	1.95	0.1621
	more than one student per table	596	162 (27.2)		





**Figure (3):** Diagram shows fluctuations in the head lice infestation among primary school children related to associated factors





**Figure (4):** Diagram shows fluctuations in the head lice infestation among primary school children related to associated factors

### Discussion

Global rate of the head lice infestation varies based on the geographical region [13]. So, it's need to compare the global and the local previous recorded results on the head lice infestation among primary school children with that result which had been recorded in the present study. Closely similar results of the head lice infestation among essential school pupils were recorded in different countries throughout the world including those of Speare [14] from Queensland in Australia (20.9%), Salemi [15] From IranShar city in Iran (27%), AL-Bashtawy [16] from Mafraq governorate in Jordan (26.6%), Rassami and Soonwera [17] from Ladkrabang, the eastern region of Bangkok, Thailand (23.32%), Karaaslan and Yilmaz [18] from Van in Turkey (23.9%) and Khamaiseh [19] from Southern Jordan (20.4%).

Among regional countries, depending on the researches which had been done in the last five years ago, a number of dissimilar prevalence of infestation by the head lice were recorded from Syria (14.3%), Turkey (11.14%) and Kuwait (46.25%), Ismail [20],

Oncu [21] and Henedi [22] respectively. In addition to variable disagree rate of infestation (13.6%, 11.3%, 2.33% and 2.6%) was noticed by Mohammadi [23] Daneshvar [24] Kalari [25] and Ziaoddini [26] from Iran respectively.

In Iraq, nearly similar results were recorded among basic pupils in Babylon (26.6%), Tikrit (22.89%), Al-Najaf (22.9%) and Mosul (22.3%) by Al-Mamouri [27]; Al- Alousi and Tawfeeq [28]; Al-Zayyadi [29] and Sulaiman [30] respectively while on the other hand, in the last years ago, there is a disagree result (9%) which was recorded by Al-Barrak [31]. among same sector in the rural and urban of Baghdad suburb.

In Kurdistan region, previously and during the last years ago a similar result (26.7%) was recorded among local secondary school in Kirkuk [32]. Disagree results were recorded in each of Erbil city (14.5%), Sulaimani (1.12%; 8.3%) and Zakho city (36.2%) from Duhok province [33,34,35 36].

Several risk factors affect the variation in the rate of infestation globally including climate, personal socioeconomic factors [13]. Changes in social structure, demography,

social soundness, relocation occurrence of good family health care system in some countries, economic and military instability, unlisted anti head lice and a high contact between rural area and urban area in some region throughout word, all have a strong relationship in the fluctuation of the rate of infestation by the head lice [37, 38,39, and 7].

At the Iraq level, variation in the rate of infestation among different Iraqi governorate related to several factors including, density of students in schools and classes were is from one region to another, local personal special style, low quality anti lice in country in addition to regions which are closely contacted with the Iranian population because of the occurrences of a large number of Iranian people in Najaf in order to apply religious visit and traveling a lot of Iraqi visitation to Iran for treat their diseases and mixing with them and it shouldn't be forgotten that Iran among the most prevalent country affected by head lice as mentioned by Al-Marjan [40,unpublished].

Other variables included poor hygiene and lower economic levels, such as families living in shanty houses, lack of in-house bathrooms, lower levels of salary and financial status and the creation of a large number of refugee camps and displaced area due to wars especially ISIS ware which leads to decreasing the level of performance of Iraqi state ministries these were all the causes of the variation in the rate of head lice infestation [41].

In this regard, if we want to give a special explanation on the Kurdistan region, we fill that there are some factors including, lack of educational plane, pour education system,

low educated family, crowded school classroom, bad life style especially at the more social quarters (Nussaran, Shoresh, 94 Badawa, Nergz and Naroz,), ISIS ware which leads to standing of huge number of unhealthy and bad designed refugee camps and displacements area. All factors lead to distribution of this parasites throughout the region in different prevalence of infestation

Finally, its need to mention that several other research error sources can affect the degree of infestation from one region to another like insufficient hair inspection (falls positive and falls negative), low response of children in schools to fill in questionnaires and return back it.

### Age groups

After hair looking of a total of 759 students with the age ranged between 6 and < 9 years old and 323 students whose age  $\geq$  9 years old. results appear that there are 178 (23.5%) and 98 (30.3%) positive cases for both groups age respectively. Statistical analysis shows that there are a strong significant relationship ( $P=0.0174$ ) between both age groups and prevalence of head lice infestation Table (2) and Figure (3A).

Several many important points to focus on related to age and rate of infestation. The older the child's age, the abler they are to stay and play, which means they stay with each other longer if they are compared to younger children which causes more contact with each other. Another point that needs to be highlighted is to pay more attention to their style and use of a variety of hats and head scarf more than those who are younger and also more use of unknown quality shampoo or another cleanser. The social situation that exists in Kurdish and Islam cannot be taken

into account, because those who are over nine years old especially girls should use hair covering cloth, which will create a suitable environment for lice growth and also changing of hair cover cloth with each other helps to transport lice easily.

Contrary to gender, the number of studies related to determining of the relationship between age and head lice infestation is little. There is a complete similarity between the results of the present study and those of Govere [42] from South Africa; Oh [43] from Korea Birkemoe [44] from Oslo in Norway and Sood [45] from sub-Himalayan region in India. Several study had been done in Iraq related to age groups and pediculosis capitis. Some of them completely agree with the results of the current study include those of Al-Rubiay [46] from Basrha and Mahmood [47] from Baghdad.

On the other hand, the previous studies which are completely contrary to the interpretations of the current study, include those of Okaho and Alikor [48] from Port Harcourt district in Nigeria and Manrique-Saide [49] from Yucatan in Mexico. Both of them confirmed that there is no any significant differences between age section and rate of pediculosis capitis among primary school children.

A numerous of other researchers show a semi-close results in their published appears compared to the results of the current study, they have proved the occurrences of a significant relationship between age and the head lice infestation, but regarding age groups do not agree with the results of the present study, in a way that the infestation is greater among children under 8 years of age unlike the present study as recorded by Al-

Bayati and Muhaisen [50] from Alkhalis twown center in Diyala province; Mahmood and Nasraddin [51] from Erbil; Lashari et al. [52] from Samina town in Pakistan; Salih [53] from Al-Njaf; Khidir [33] from Erbil; Ali and Hama [34] from Sulaimania; Marinaho [54] from Uberlândia in Brazil; Dagne [11] from Woreta town in Ethiopia and Tawfeeq [9] from Tikrit.

### Gender

Followed inspection of a total of 652 girl's hair and 430 of boy's hair for the occurrences of the head lice, *Pediculus humanus capitis*, results appear that there are 215 (33%) and 61 (14.2%) positive cases for both sex respectively. Statistical analysis shows that there is a strong significant relationship (P-value < 0.001) between female and male infestation Table (2) and Figure (3 B).

It can be ascribed to gender-related behavioral contrasts for example, girls go to the alley and school square a lot to play and mix with other children, and girls have more social relationships to mix with each other than boy which lead to more head contact with each other on the contrary that boys have less time to play with each other and less contact. Other girl's behavior including changing of their hats or scarf with each other which leads to direct transport of parasite. Density of girl's hair which is more than boy's hair and assist in the hiding of parasite. Greater oily hair among girl's hair among the additional expected factors which have relation with the rate of infestation among females.

The present result was acceptable with that performed by Hatam-Nahavandi *et al* [7]. They mentioned that there are 86 papers mentioned gender-specific prevalence

concerning during the past fifty years ago (1977-2020) throughout the world and confirmed that the girls were infested more than twice as much as boys. Several study which had been done in Iraq and Kurdistan region confirmed this results including those of Al- Khafaji [55]; Al-Bayati and Muhaisen [49]; Al-Alousi and Tawfeeq [28]; Al-Aboody [56]; Al-Marjan and Kamil [40]; Abdullah [57]; Muhamad and Nasraddin [51]; Khidhir [33]; Obaid [58]; Ali and Hama [34]; Amin [59]; Sulaiman [30] and Tawfeeq [9] while dis agree with that conducted by Al-Rubiay [45]; Al-Mamouri [27]; Al-Makky and Darwesh [60].

**Personal condition and life style**

Several variables associated with the personal condition and their life style were stabilized in questionnaire list for the find its relationship with the head lice infestation including, education levels of parents, hair types, hair washing, hair combing and sleeping habitat.

Regarding educated level of parents, a total of 694 children from educated families and 388 children of none educated family were included in this study. Results reveals the existence of the 146 (21%) and 130 (33.5%) positive cases for educated and none educated children for both parent education levels respectively Table (2) and Figure (3 C). Statistically there is a significant relationship (P-value < 0.001) between educated level of parents and their children lice infestation.

The high level of awareness of parents, especially mothers, which is directly related to raising their children, has a direct role because mothers should have information about the type and quality of shampoo and

other cleanses when washing their children's hair and have information on how to dry hair in addition to prevent children from mixing with infected children and information on how to warn their children how to protect themselves from infected school children.

Similar results were mentioned by Saed [61] and Sulaiman [30] from Mosul; Al-Bayati and Muhaisen [49] from Diyala; Al-Makky and Darwesh [60] from Karbala; Kadir [32] from Kirkuk; Ali and Hama [34] from Sulaimania while dissimilar results were recorded by Al-Mamouri [27], Mahmood [47] from Baghdad and Ali [62] from Erbil province.

Regarding types of hair, all examined students divided to four groups, long and short hair; smooth and wrinkle hair. A total of 473 long haired students and 609 short haired one were participate in this study. Results reveals the existence of the 157 (33.2%) and 119 (19.5%) positive cases for both hair types respectively Table (2) and Figure (3 D). Statistically there is a significant relationship (P-value < 0.001) between longevity of hair. A conceivable clarification for this could be that females in most Erbil elementary schools, usually have longer hair than male. The former one, could be a more suitable territory for lice to replicate, feed and secure them. This might be due to the habit of female understudies to have long hairs that can harbor the parasite and have near connections with other young ladies.

The most research that has been done before in Iraq and the Kurdistan region, does agree with our results included those recorded by Al-Bayati and Muhaisen [50]; Al-Mamouri [27]; Al-Makky and Darwesh

[60]; Al-Aboody [56]; Mahmood [47]; Abdullah [57]; Khidhir [33]; Ali and Hama [34]; Sulaiman [30]; Tawfeeq [9]. The only thing that exists is the results of Al-Alousi and Tawfeeq [28] from Tikrit, that are completely dissimilar to the results of this study.

Seven hundred and forty one smooth haired (741) and three hundred and forty one (341) wrinkled hair school children were inspected for the occurrences of the head lice. Results reveals the existence of the 183 (24.7%) and 93 (27.3%) positive cases for both hair types respectively Table (2) and Figure (3E). Statistically there is no any significant differences ( $P = 0.366$ ) between both hair types. This may due to several modification of lice leg, example tibiotarsus claws among a well modification of the adult lice which was help the parasite to hanging and grasping host hair of any kind whether smooth or wrinkle as mentioned by Mullen and Durden [63]. Similar results have not been recorded previously in Iraq and Kurdistan region but there are more than ten researches that their results are completely contrary to the results of this research included those of Al-Bayati and Muhaisen [50]; Al-Mamouri [27]; Al-Alousi and Tawfeeq [28]; Al-Aboody [56]; Khidhir [33]; Ali and Hama [34]; Al-Zayyadi [29].

Regarding hair washing, students were asked whether they washed their head daily or weekly. In a total of 1082 responded pupils, appear that there are 587 pupils washed hair daily and others (495) washing their hair twice in a week. Results appear that there are 243 (41.4%) and 33 (6.7%) positive cases for the occurrences of head lice for both occasions respectively Table (2) and

Figure (3 F). Statistically there is a significant relationship between hair washing and pediculosis capitis ( $P$ -value  $< 0.001$ ).

Daily hair washing especially in the winter season which is the school season in Kurdistan region, it makes girls especially after washing their hair to use head scarf and also mothers who was fear of getting their children to get to cold symptoms wrapped their children's heads and ears very well and this will be the reason for creating a hot and humid environment in the hair which effect on the growth and reproduction of head lice positively as confirmed by Al-Marjan et al. (64). In Iraq Previously, only Sa'ed (60) obtained bathing frequency as a risk factors for pediculosis and their results agree with the current results.

Regarding using of comb, a total of 499 and 583 of school children were examined, the former using common comb and the later, they are the one who used special comb. Results reveals the existence of the 165 (33%) and 111 (19%) positive cases for groups respectively Table (2) and Figure (4G). Statistically there is a significant relationship ( $P$ -value  $< 0.001$ ) between whose using common comb and whose using special comb.

The use of only one comb for hair combing in our Kurdish community has decreased greatly because our young people care about their own style in a surprising way, even our children, and do not satisfied to use each other's materials. However, in the present study appears that the rate of infestation is higher among those who use only a comb for all family members in a home because the comb, especially if it is with narrowed teeth, causes carrying of the lice nymphs and

transports it to the latter person directly and quickly.

In Iraq and Kurdistan region there are no any study related to determination of the relationship between using of comb and head infestation by lice. So the present study considers as a first attempt for this purpose.

Everything about the environment at home is the right place to sleep, which should not be too crowded, to investigate the relationship between rate of infestation and the number of people sleeping in one room nearby 693, they were checked for lice detection and nearly 389, they were checked for the same purpose for both groups, sleeping habitat together and alone respectively. The results of the inspections showed that 222 (32%) and 54 (13.9%) infested cases for both group of room sleeping respectively Table (2) and Figure (4H). Statistical research shows that yes there is a significant connection ( $P$ -value  $< 0.001$ ) between the two sleep groups.

High population density and their proximity to each other are the main causes of the rapid overcrowding of parasites that have no wings to fly, however large number of people at home, at school, or in cities it selves. It is very important for each child to have a different place for sleeping, the financial situation of the Kurdistan Region is good compared to previous years as in the current results show that out of 1082 families, 693 families have provided a sleeping room for each child alone, but this is not true for all the families in Erbil city because some of them have a bad financial situation and they can't provide a special place for their children to sleep and this has made the rate of infection more. In Iraq and

Kurdistan region there are no any study related to determination of the relationship between sleeping condition and head infestation by lice. So the present study considers as a first attempt for this purpose.

### **School habitat**

Density of pupils in each classes were obtained as a parameter for the understanding whether it have role in the determination the rate of infestation among pupils or not?

For this purpose, students were separated from all 22 schools based on the number of students in their classrooms. Results were as 486 students were sitting alone in classrooms tables and 596 were sitting in pairs. This investigation showed that 114 (23.5%) and 162 (27.2%) infested cases for both sitting design respectively Table (2) and Figure (4 I). Statistical research shows that there is no significant connection ( $P = 0.1621$ ) between the two sleep groups.

This result was dissimilar with the results of Mahmood [46] from Baghdad and Amin [58] in Kalar district from Sulaimania province.

If look more generally at the global results over the past fifty years ago which was analyzed through a meta-analysis review by Hatam-Nahavandi [7] related to determining personal condition and life style with the lice infestation among primary school children. They analyzed two hundred and one studies, thirty-eight studies have discussed the relationship between hair size and lice infestation, of which 23 do not match the results of the present study ( $P < 0.05$ ) and they had also been found that twenty-five studies related to pediculosis capitis and the education level of mothers, this again incompatible with our current results. Same

researcher also found that the little research has been done on the relationship between hair washing frequency and a number of them (12 papers) agree with the present study.

### Conclusions

It had been concluded that head lice infestation rate was varied depending on the several physio and socioeconomic factors including, age, gender, type of hair, parents education level, hair washing frequency, sleeping habitat and condition of hair combing. Among variables, only density of pupils in classroom, smooth and wrinkled hair show no any significant relationship with pediculosis capitis (P- value = 0.1621 and P – value = 0.366 respectively).

### Recommendations

- 1-The committee should be formed in the Ministries of Health and Higher education to hold seminars on how to spread the head lice and how to protect with it.
- 2-Distribution and giving anti lice by the ministry of Health free of charge to students.
- 3-The spread of student hygiene among students by teachers in a way that talks about the prohibition of over-clashing and exchanging students' special materials between themselves and drying hair after washing especially during the cold season.
- 4-Conducting further researches on the molecular analysis and determination of the head lice clades and any genetic changes that may have occurred.

### Acknowledgment

It's necessary to thank the general director of education in the central of Erbil City, who gave us a lot of data and information about the schools as well as special thanks are extent to school directors in the city who

helped us during checking the students for the head lice observations.

**Source of funding:** This research was funded by ourselves and there is no other funding cover this study or manuscript preparation and publication.

**Ethical clearance:** The project for this study was taken from the College of Medicine/ University of Diyala ethical committee.

**Conflict of interest:** Nil

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## دراسة وبائية لقمل الرأس (*Pediculus humanus capitis*) المعزولة بين طلاب

### المدارس الابتدائية في مدينة أربيل، إقليم كردستان، العراق

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#### الملخص

**خلفية الدراسة:** الارتباط بين الإنسان وقمل الرأس (*Pediculus humanus capitis*) هو واحد من أقدم العلاقات وتاريخها يعود إلى ١٠٠٠٠ سنة مضت. تنتمي إلى المملكة: Animalia، الفئة: Insecta، النظام: فيرويتيرا، الأسرة: Pediculida، جنس: Pediculus، النوع: humanus، والأنواع الفرعية: capitis وهي الطفيلي الاجباري على الإنسان المتخصصة للغاية لامتصاص الدم وارتباط وثيق مع مضيفهم حيث تكمل دورة حياتها بأكملها على الانسان.

**اهداف الدراسة:** لتحديد معدل الإصابة بقمل الرأس والعوامل المرتبطة به بين أطفال المدارس الابتدائية في مدينة أربيل.

**المرضى والظرائق:** اجريت الدراسة الحالية على ٢٢ مدرسة ابتدائية تم اختيارها عشوائيا في وسط مدينة أربيل. ولهذا الغرض، تم فحص ما مجموعه ١٠٨٢ طالبا (٤٣٠ ذكور و ٦٥٢ انثى) من المرحلة الأولى إلى السادسة (سن  $\leq 6$  سنوات) خلال الفترة من ١ أكتوبر ٢٠٢٠ إلى ٣١ مايو ٢٠٢١. تم تسجيل المعلومات الشخصية المطلوبة من قبل الطلاب الأباء في استمارة استبيان.

**النتائج:** سجلت الدراسة الحالية معدل انتشار عام للإصابة بنسبة ٢٥,٥% (١٠٨٢/٢٧٦). وكشفت الدراسة عن وجود الفروقات المعنوية بين عمر ونسبة الإصابة [٦ سنوات و أقل من ٩ سنوات، ٧٥٩/١٧٨ (٢٣,٥%)، و  $\leq 9$  سنوات، ٣٢٣/٩٨ (٣٠,٣%)،  $P = 0,0174$ ]، نوع الجنس [الاناث، ٦٥٢/٢١٥ (٣٣%) والذكور، ٤٣٠/٦١ (١٤,٢%)،  $P < 0.001$ ]، مستوى تعليم الوالدين (الأسرة المتعلمة، ٦٩٤/١٤٦ (٢١%)، ولا عائلة متعلمة، ٣٨٨/١٣٠ (٣٣,٥%)،  $P < 0.001$ ]، طول الشعر [الشعر الطويل، ٤٧٣/١٥٧ (٣٣,٢%) والشعر القصير ٦٠/١١٩ (١٩,٥%)،  $P < 0.001$ ]، غسل الشعر [الغسيل اليومي، ٥٨٧/٢٤٣ (٤١,٤%)، والغسيل الأسبوعي ٤٩٥/٣٣ (٦,٧%)،  $P < 0.001$ ]، حالة تمشيط الشعر [مستخدم المشط الشائع، ٤٩٩/١٦٥ (٣٣%)، ومستخدم المشط الخاص، ٥٨٣/١١١ (١٩%)،  $P < 0.001$ ] وموئل النوم [النوم معا ٦٩٣/٢٢٢ (٣٢%)، وموئل النوم وحده، ٣٨٩/٥٤ (٩,٩%)،  $P < 0.001$ ]. لم تظهر فروقات معنوية بين نسبة الإصابة وة فيما يتعلق بكثافة الطلاب في الفصول الدراسية [طالب واحد لكل طاولة، ٤٨٦/١١٤ (٢٣,٥%)، ويجلس في زوج، ٥٩٦/١٦٢ (٢٧,٢%)،  $P = 0$ ] وة نوع الشعر، الناعم وتجدد [شعر ناعم، ٧٤١/١٨٣ (٢٤,٧%)، شعر ناعم، ٣٤١/٩٣ (٢٧,٣%)،  $P = 0.366$ ].

**الاستنتاجات:** أن معدل الإصابة بقمل الرأس يختلف باختلاف العوامل الفيزيائية والاجتماعية والاقتصادية بما في ذلك العمر والجنس ونوع الشعر ومستوى تعليم الوالدين وتكرار غسل الشعر وموئل النوم وحالة تمشيط الشعر. من بين المتغيرات، فقط كثافة التلاميذ في الفصل، والشعر الأملس والمتجدد لا يظهر أي علاقة معنوية مع قمل الرأس ( $P = 0,1621$ ، القيمة = ٠,٣٦٦ على التوالي).

**الكلمات المفتاحية:** Pediculosis، *Pediculus humanus capitis*، قمل الرأس، علم الأوبئة، أربيل

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