Infestation of Head Lice, Pediculus humanus capitis, in Primary School Children at Houn City, Libya

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ABSTRACT:

Objective: *Pediculosis* is a worldwide public health concern, and today, head lice are seen in all socio-economic levels. The infestation usually occurs by head-to-head contact and children, primarily girls, aged 3-12 years are mostly affected. **The aim of study** was to estimate the incidence and the epidemiological factors related to *Pediculus humanus capitis* infestation among the primarily schoolchildren population in Houn city. **Material and Methods:** The present study was performed during March and April 2016 in three primary schools children in Houn, city, Libya, total of 493 schoolchildren (255 Male and 238 Female) was examined for *pediculosis humanus capitis.* A child was defined as being infested by the presence of live or dead lice (nits, adults and immature). Data was obtained through a questionnaire containing 6 multiple choice questions for the students. Statistical analysis was conducted using the SPSS software package. Categorical variables were defined as the number and percentage (%) and analyzed using the Chi-square test. *P* values less than 0.05 were accepted to indicate statistical significance.

Results: Overall, 493 students (21.9%) were found infested with nits, immature or adult of *Pediculus humanus capitis*. Male children had a lower rate of infestation (6.27%) than females (38.66%). School children exhibited decreased in infestation rate with age groups, the children aged 7-8 years were the most frequently affected, there was no significant difference. There was a significant relationship found between head lice infestation and nationality, hair length and the frequency of hair-washing of schoolchildren ; Infestation was observed to be high in longer hair category (28.86%), non-Libyan children (33.33%) and in terms of hygiene practices, the prevalence of head lice infestation was significantly associated with decrease the frequency of hair-washing per week (*P=0.000*).These factors indicate that head lice infestation depends on socioeconomic status and hygienic practices in the home of the family. Direct association of pediculosis was also found with hair lubrication, hair length, and scalp pruritus (50%), fever (50%), and dandruff (31.25%).

Conclusion: this study concludes that pediculosis constitutes a public health problem among primary schoolchildren in Houn city. The hygienic practices in the home of the family are a major

factor influencing the occurrence of pediculosis among school children of both sexes. More emphasis should be given to the education of parents regarding their biology and control. In addition to improvement in socioeconomic status, collaborative and participation efforts among physicians, teachers, and parents are necessary to maintain effective epidemiological surveillance and provide treatment**.**

Introduction:

Lice are permanent, obligatory ectoparasite spending their entire life cycle on the host (butler, 1985). Three distinct varieties of lice are specifically parasitic for humans. Two of them, *pediculus humanus capitis* de geer (anoplura: pediculidae), the head louse, and *pediculus humanus humanus*, the body louse, are closely related variants of the same species, despite their different habits and habitats. The third species is *phthirus pubis*, the pubic louse commonly known as the "crab louse" (goldstein and goldstein, 2006). The human head louse, *pediculus humanus capitis* are bloodsucking insects, is a common public health concern, especially in children. It is an obligate holometabolous ectoparasite that spends its complete life cycle in hair on a human head (gutiérrez, *et al.;* 2012).

Lice have no wings or powerful legs for jumping, so they move by using their claw-like legs to transfer from hair to hair (Weems and Fasulo 2007). Transmission occurs mainly by direct physical contact with the parasite migrating from head to head (Catala, *et al.,* 2005) *P. capitis* can infest people of all ages, but children are prone to infestations because of their habit of playing in close contact, sharing instruments such as hats, head-phones, combs, brushes, towels, clothing , pillows and beds or closets , (Rust *et al.,* 2001), Head lice can live off the head, for example on soft furnishings such as pillow cases, on hairbrushes, or on coat hoods for up to 48 hours (Anderson and Andrea, 2008).The most group at risk is generally those between 6 and 12 years of age, adults and older children who have familial contact with a child or primary school children are also susceptible to infection (Burgess, 1998, Noyan, 2006 and Kokturk, 2003).

Although *Pediculus humans' capitis* are not known to be vectors for illnesses, complications derived from parasitism, such as scalp lesions caused by scratching, secondary bacterial infection, excoriation, conjunctivitis, local post-therapeutic dermatitis, occipital and posterior cervical lymphadenopathy and pruritis is the most common symptom (Catala, *et al.,* 2005), unspecific generalized dermatitis, chronic anemia by pillaging, and even secondary myiasis, in extreme cases, can occur, and allergic reactions resulting in nasal obstruction and rhinorrhea. Head lice infestation may also lead to psychological distress and may disrupt learning performance in schoolchildren (Gutiérrez, *et al.;* 2012 and Mohammed, 2012). Lice infestation can spread rapidly and may reach epidemic proportions if left unchecked in a group of people, such factors as age,

race, sex, crowding at home, family size, method of closeting clothes and socioeconomic status influence the course and distribution of the disease (Slonka*et al.*, 1975; Weems-Jr and Thomas, 1999). Therefore, it is essential to obtain epidemiological data from different regions to enable strategic planning for the control and prevention of pediculosis.

It is widely accepted that the school environment aids in the spread of the infestation simply because it affords an opportunity for the continual close contact of children. However, the prevalence of infestation and the pattern of transmission are also largely influenced by the family size and the number of school-aged children in the family (Maunder, 1982, Petrelli, *et al.*, 1980).

Aim of study:

There are no published data available about the incidence of head lice in schoolchildren in Houn-Aljuofra. Therefore this study was undertaken determine the prevalence and the epidemiological factors of *Pediculosis humanus capitis* among some primary-school children living in Houn city, Libya.

Material and methods:

This descriptive study was conducted between March and April 2016 in urban area in Houn city, Aljuofra, Libya. which is located in 240 km south of Sirt, 370 km from Muisrata and 272 km north of Sabha (29°07′16″n 15°56′25″e). Houn has a hot desert climate with long, extremely hot summers and short, warm winters as well as very little rainfall throughout the year. Population total in Houn city is 30,715. A total of 493 school children enrolled in 3 elementary school were examined for the presence of *pediculus human capitis* (nits, adults and immature). Detailed questionnaire including age, gender, nationality, hair length, number of hair washes per week and other relevant data, was recorded (were included in the present results). All the 3 schools were located in urban area of Houn city.

The diagnosis of Head Lice infestation was confirmed by clinical inspection of scalp and hair under the light of a reading lamp and by using a manual magnifier for the presence of adult lice, nymphal stage or eggs (nits). The student was considered infested if at least one adult, nymph, or egg was present. All of the pupils were examined generally and locally for head lice or nits according to the standard method of Morsy, *et al.*, (1991).Collected samples were prepared and mounted, then examined for identification according to the method of Kim and Ludwig (1978). For each student, a questionnaire was completed during the interview containing data about his/her name, age, sex, Hair length, and, the frequency of hair-washing, and nationality.

The sample population was children ranging in age from 6–15years old who were diagnosed with head lice infestation. All Each of the children who were enrolled in the study was assigned to 3 age groups. These groups were divided as follows: 7- 8, 9-10 and 11-13 year of age.

Statistical analysis:
Was conducted using the SPSS software package. Categorical variables were defined as the number and percentage (%) and analyzed using the Chi-square test. *P* values less than 0.05 were accepted to indicate statistical significance.

Results:

A total of three primary schoolchildren were randomly selected from 9 of the government-run schools in Houn Aljuofra and then interviewed and examined. Demographic data and the prevalence of infestation are shown in tables 1-2.

Prevalence: Out of 493 children 108(21.9%) were infested with *Pediculus human capitis* and 385(78.1%) were non-infested, there was a high significant difference between infestation rates (p=0.000). Table (1)

Gender: Out of 493 children 255 (51.72%) were males and 238 (48.28%) were females. A significantly higher proportion of females (38.66%) were found to be infested as compared to males (6.27%), (P = 0.000).Table (1)

Age groups: there was no significant difference between the *Pediculus human capitis* infestation rates according to age groups (P > 0.05). The high infestation rate was 22.58% reported in (7-8 year) age group, followed by 22.29% infestation rate in age group (9 - 10 year), followed by 20.93% infestation rate in age group (11-13 years), respectively. Table (1)

Table (1): The prevalence of *Pediculus human capitis* infestation according to gender and age groups

Prevalence		Infested	Non-infested	Total	*Chi- Square test*
		108(21.9%)	385(78.1%)	493 (100)	*p=0.000*
Gender	Male	16 (6.27%)	239 (93.72%)	255(51.72%)	*P=0.000*
	Female	92(38.66%)	146(61.34%)	238(48.28%)	
Age groups	7 - 8 year	35(22.58%)	120(77.42%)	155(31.44%)	*P>0.05*
	9 - 10 year	37(22.29%)	129(77.71%)	166(33.67%)	
	11-13 year	36(20.93%)	136(79.07%)	172(34.89%)	

Nationality was significantly related to the prevalence of *Pediculus human capitis* infestation. The prevalence of infestation was significantly higher among non-Libyan children 33.33% (8/24) than Libyan children 21.32% (100/469). *(P = 0.000)*. Figure (1)

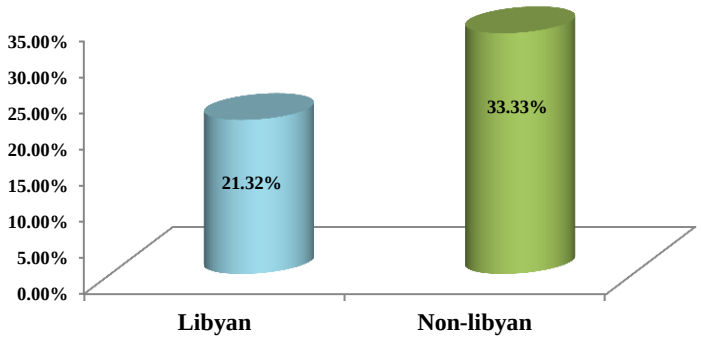

Figure (1): The prevalence of *Pediculus human capitis* infestation according to nationality.

Hair length: Hair length was categorized into short, medium and long following the scheme of Sinnah *et al.* (1983) and Suleman and Fatima (1988) as short (above collar and ear), medium (above shoulder) and long (extending below shoulder) in 238 females. All of 255 males had short hair. The infestation rate was differing significantly (*p= 0.01*). The infestation rate was higher in long hair category (28.86%) than in short hair category (17.24%), no infested cases were observed in children with medium hair, shown in the Table 2

Table (2): The prevalence of *Pediculus capitis* infestation according to length, washing and cleaning hair.

		Infested	Non-infested	Total	*Chi-Square Tests*
Hair length	Long	58 (28.86%)	143(71.14%)	201(40.77%)	*p=0.01*
	Medium	zero	2(100%)	2(0.41%)	
	Short	50(17.24%)	240(82.76%)	290(58.82%)	
washing and cleaning hair/week	Once	69(63.30%)	40(36.69%)	109(22.11%)	*p=0.000*
	Twice	21(23.33%)	69(76.67%)	90(18.26%)	
	Three times	12 (13.79%)	75(86.21%)	87(17.65%)	
	Four times	4 (4%)	96	100	
	All week	2 (1.86%)	105(98.13%)	107(21.70%)	

Washing and cleaning hair: In terms of hygiene practices, the prevalence of *Pediculus capitis* infestation in relation to frequency of washing children hair was analyzed. It was found that, the infestation rate was significantly associated with the frequency of hairs washing per week (*P=0.000*). The infestation rate was significantly higher (63.30%) among children washing hair ≤ 1 time per week compared with (23.33%, 13.79%, 4% and 1.86%, among those washing hair 2, 3, 4 and 7 times per week, respectively. Table (2)

The prevalence of *pediculus human capitis* associated with some clinical manifestations in schoolchildren: Table (3) shows some clinical manifestations possibly associated with *Pediculus*

human capitis infestations, dandruff was associated in 31.25%, Scalp pruritus and fever was associated in 50% of infestation rate cases, these are considered nonspecific characters, this result showed 16.71% infested rate cases without clinical manifestations. Scalp pruritus and fever was represented with a highly statistically significant difference (P =0.000). Based on chi-squared tests, the relationships between head lice infestation and all of the other clinical manifestations examined were statistically significant.

Table (3): The prevalence of *pediculus human capitis* associated with some clinical manifestations in schoolchildren

Infested children	Infestation		Total
	Dandruff and Scalp pruritus	Without Dandruff and Scalp pruritus	
	50(46.30%)	58(53.70%)	108
Chi-Square-test/ p=0.000	5(50%)	5(50%)	10

Discussion:

Pediculosis is the most prevalent condition in school- and preschool-age groups throughout the world; especially in developing countries (Aydemir, *et al.,* 1993). The present study is the first one to address this important public health problem in the Houn city, Al Jufrah, Libya.

In the current study, the prevalence of *pediculus human capitis* infestation was about 21.9% among primary school children in Houn city. Overall, students were infected with nits or immature or adult lice, that is different than the infestation rate which has been reported in different parts of Libya, among a similar population, For example, reported among a similar population in Benghazi about78.6%, (Bharija *et al.,* 1988) and 7.33% infestation rate in Muisrata (Faraj, 2016). There may be a number of likely explanations for this difference, including lifestyle and environmental issues furthermore, may be the surveys which were conducted in other city from Libya during different seasons with different socioeconomic status and lifestyles. *Pediculosis human capitis* is more prevalent in schoolchildren and the rate of head lice infestation shows a wide range (up to 80%) among various countries worldwide (Mohammed, 2012), 9.4% Inanir *et al.,* (2002), 20.3% Ozcelik *et al.,* (2006) and 5.1% Atambay (2007) in Turkey, 28.3% in the United Kingdom (Downs 2006) and in Iran 1.8% Motovali *et al,* (2008).

In the Middle East, head lice infestation is a public health issue. In Abha, Saudi Arabia, an infestation rate of 19.8% was reported among school boys (Bahamdan *et al.,* 1996). Eight percent of Lebanese public school students harbor pediculosis (Saab *et al.,* 1996), (5.1%) Palestine (Al-Shawa 2006), Saudi Arabia (5.2%), 12% Al-Saeed (2006) and Boyle, (1987). in Egypt 16.8% Amr, (2000), (5.5%) El-Basheir and Fouad (2002) and 16% Nada *et al.,* (2006), in the old Gaza

city and the rural village Jabalia within the Gaza Governorate the rate of infestation with lice was 14.1% in the primary school girls (Al-Shawa, 2006) and 21.9%, 26.6% in Jordan (AlBashtawy and Hasna 2012).

In almost all previous studies in the world, the prevalence of *Pediculosis human capitis* infestation in school males was lower than the prevalence of the infestation in school females. In the present study, the prevalence of head lice in females (38.66%) was also greater than (6.27%) in males, which concurs with the results of other study done in Benghazi which reported 88.1% in females and 67.2% in males (Bharija *et al.,* 1988) and in worldwide (AlBashtawy and Hasna 2012), Kokturk *et al.* (2003), Counahan *et al.,* (2004). While they differed with other result done in Muisrata reported 2.74%% infestation rate in females and 3.39% in males (Faraj, 2016). This difference might be explained by females generally having longer hair impedes detection of an infestation as compared to short hair of males (Mohammed 2012 and Soultana *et al.,* 2009), differing behavioral characteristics, such as close head contact between females than between males have brief contact during daily playing and sporting activities, while females tend to have closer, prolonged head contact in small groups (Gutiérrez *et al.,* 2012) and (Speare and Buettner 1999), head-to-head contact is as important as passive transmission of pediculosis with shared objects like barrettes, combs and towels (Oğuzkaya *et al.,* 2006). Skin factors or effects of hormones such as progesterone and prolactin may be associated with this tendency (Gutiérrez *et al*., 2012), Kokturk *et al*., (2003), Oh JM, *et al.,* (2010), Speare and Buettner (1999) , Toloza *et al.,* (2009).

Although, we don't found any significant differences between infestation rates according to different age groups of school children, the present results reported more infestation rate in young age groups compared to the old age group. The high infestation rate was 29.63% (16/54) of age group 7- 8 years. This accordance with other studies which reported similar findings as Khokhar, (2002) who reported the highest risk for *pediculosis capitis* in the age group 6–12 years; Mohammed, (2012) in Jordan reported a higher infestation rate in younger children (<9 years); Morsy *et al.,* (2001) reported similar findings among primary school pupils in Cairo, where they found that younger pupils (6-8 years) had much higher rates of infestation than older ones; Alzain (2012) who found that younger pupils (6-8 years) had much higher rates of infestation than older ones; Chowsidow *et al.,* (1994) *P. human capitis* affects millions of humans globally especially children of 3-14 years of all socioeconomic groups and Elserite (2016) in Muisrata reported highest infestation rate (9.8%) in urban School children pupils who were 6 years old. This is in disagreement with the results of a number of previous studies as Soultana *et al.,* (2009) who

showed that the infestation rate increased by 15% for every year of age and (Bibi 2011) in Pakistan, the prevalence of *P. capitis* was highest (80.0%) in age group of 61-75 years and lowest (46.2%) in age group of 31-45 years. The low infestation rate in older age groups observed in the present study may be indicate that better personal hygiene practices, including the regular combing and washing of the hair, are probably the main reason for the low head lice infestation rate in this group in comparison with the other, younger groups, made up of students who may need help from their parents in combing and washing their hair, and the lack of information about pediculosis transmission routes may facilitate infestation of young children.

The *Pediculus human capitis* infestation rate was high significantly increased in non-Libyan children compared to infestation rate of Libyan children. The reason for this difference could be explained by the fact that, the some of the non-Libyans came from countries was infested with *Pediculosis*. *Pediculus capitis* is an infestation that affects mainly children in the world, depending on the socio-economic setting; these infestations may affect a large proportion of a population. It is generally seen in winter months and in cold and mild climates and has a cosmopolitan distribution. Geographical, ethnic, hygienic and climatic conditions play an important role in the distribution of the parasite in world.

In this study, hair length factor was found to be significant correlated with infestation rates of pediculosis. Children with long hair had high infestation rate compared to those with short hair. This may be explained by the long hair is more difficult to comb and keep clean. It in comparison with short hair and the long-hair may provide a reservoir for the survival and reproduction of lice. This results was agreement with our study was reported by Sinniah *et al.*, (1981, 1983), Suleman and Fatima (1988), Schenonel and Lobos (1997), El-Basheir and Fouad (2002), Ramirez *et al.*, (2003), Ali and Ramzan (2004), Willems *et al.*, (2005), Alzain (2012) and AlBashtawy and Hasna (2012).

The present results reveal the indirect significant association of *Pediculus human capitis* infestation rate with frequent of hair washing per week. The children group which washing hair once per week reported high infestation rate was 63.30%. This reinforces the importance of hair care (washing and brushing) and the frequency of hygiene practices in the prevention of lice infestation. This result was similar to some studies in different parts of the world as Borror and Delong (1971), Chunge (1986), Schenonel and Lobos (1997) and Ali and Ramzan (2004). Shagufta *et al.*, (2008), Dursun (2010), Mohammed (2012) and AlBashtawy and Hasna (2012), who found a strong significant correlation between lice infestation and the presence of bathing facilities in the home as well as the frequency of hair washing. On the other hand, another study

did not detected significant association between head lice infestation and frequency of bathing and use of a cleansing material for hair washing (Kokturk, *et al.*, 2003 and Mahmud, *et al.*, 2011). The relation between the prevalence of *pediculus human capitis* and some clinical manifestations in schoolchildren: The present results some clinical manifestations associated with *Pediculus capitis* infestations, dandruff was associated in 31.25%, Scalp pruritus and fever was associated in 50% of infestation rate cases, these are considered nonspecific characters. This agreement with (Alzain, 2012) which mentioned some of associated clinical manifestation of scalp pruritus (10.3%) was found to be present to a statistically significant degree, and impetigo (9.8%) also occurred to a statistically significant degree. (Nada, 2006) mentioned some of these associated clinical manifestations, such as scalp pruritus in 58.9%, alopecia in 22%, fever in 25.3% and impetigo in 38%.

Recommendation:

1. Collaborative efforts among health staff, physicians, nurses, teachers, and parents are necessary to maintain effective epidemiological surveillance and provide the optimal treatment.
2. A lower prevalence can be achieved through health education programs for students and parents, particularly with regard to the importance of early detection and effective management strategies. These measures, along with curing infected students and possible cases within the family, will decrease the rate of infestation and lead to greatly improved control.
3. Large-scale information campaigns and more health screening programs designed to reach the majority of children and families are necessary for effective control of pediculosis.

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