International Journal of Epidemiologic Research
doi:10.34172/ijer.2020.12 2020 Spring;7(2):58-62 http://ijer.skums.ac.ir

Original Article

Investigation of the prevalence of Head Lice and Factors Affecting Them in Infected People Referring to Gerash County Health Center

Elham Rezaee[1*], Fatemeh Heidari[2], Mohammad Nowrouzi[3]

[1]MSc in Medical Parasitology, Gerash University of Medical Sciences, Gerash, Iran.
[2]MSc in Intensive Care Nursing, Gerash University of Medical Sciences,Gerash, Iran.
[3]BSc in General Health, Gerash University of Medical Sciences, Gerash, Iran.

*Corresponding Author:
Elham Rezaee,
MSc in Medical Parasitology, Gerash University of Medical Sciences, Gerash, Iran.
Email : rezaee.para92@gmail.com

Abstract

Background and aims: Pediculosis is one of the most common parasitic diseases that affect a wide range of age groups. The prevention of head lice infections promotes the physical and mental health of people in the community. Thus, the aim of this study was to investigate the prevalence of head lice infections and the factors affecting them in those who referred to health centers in Gerash County from 2011 to 2018.

Methods: This descriptive cross-sectional study was conducted on patients suspected with head lice infections in health centers in Gerash. These infections were diagnosed by observing adult lice, nymphs, or nits on the head with the help of a magnifying glass. The collected data were then analyzed using SPSS software, version 22 and $P<0.05$ was considered as the significance level.

Results: In general, 66410 patients suspected with head lice were examined, of whom 2,547 cases (3.83%) were reported with confirmed infections including 2395 female (94.03%) and 152 male (5.97%) cases. The highest levels of infections were reported in the age group of 6-10 years while the lowest levels of infections were found in children less than 6 years of age. A significant statistical relationship was observed between head lice and gender, age, season, and the place of residence, and year of infection ($P<0.05$).

Conclusion: Due to the increasing trend of head lice infections in recent years, pediculosis is still considered a health problem. Therefore, training on personal hygiene, adequate access to health services, and early diagnosis and treatment can play an important role in the prevention and elimination of head lice.

Keywords: Head lice, Pediculosis, Epidemiology, Gerash

Received: 19 Feb. 2020
Accepted: 22 Apr. 2020
ePublished: 28 June 2020

Introduction

Although human lice infestation and the fight against it have a history of several thousand years, a lice infestation is still a health problem in today's societies.[1-3] Of more than 3000 identified lice species, body lice (*Pediculus humanus* Corporis), head lice (*Pediculus humanus capitis*), and the crab louse (*Phthirus pubis*) are among the most common human ectoparasites.[4] These lice are found in different geographical areas and their prevalence is directly related to population density, poverty, and the lack of regarding the principles of personal hygiene. Although infection with this parasite can occur at different ages, the highest prevalence has been reported in school children, which can lead to complications such as anemia and academic failure due to insomnia caused by nighttime itching.[5,6]

Annually, about 6 to 12 million people worldwide are infected with this parasite[5] and the prevalence of head lice infections has been reported to be 6 to 30% in different parts of Iran.[7] The main transmission mode of this disease is direct contact and the most common transmission mode of the infection is close head-to-head contact with the infected person.[8,9] Other routes of transmission include the common use of contaminated objects such as towels, combs, hairbrushes, hats, scarves, headdresses, prayers chador, and pillows. The indirect transmission of the parasite is also carried out by the seats of community halls, classrooms, public transport vehicles, wardrobes, public bathrooms, and swimming pool locker rooms.[9-11] All stages of head lice development, including eggs, nymphs, and adult parasites, are most common near the neckline, in the back of the head, and behind the ears.[1] Lice can transmit various diseases to humans, including epidemic typhus, febrile convulsion, and louse-borne relapsing fever.[10,12]

These types of arthropods are blood-sucking and when

the louse sucks the blood from the infected person's body, the parasite's saliva is often injected into his/her body thus its toxic effects on infected people may cause fatigue, irritation, severe allergies such as itching, and feeling of laziness.[5,13] To the best of our knowledge, no detailed and comprehensive study has so far focused on the prevalence of lice infestation and the identification of factors involved in it in Gerash county. Due to the importance of preventing and fighting the spread of lice infestation to prevent its adverse social, economic, and health consequences, this study was carried out aiming at determining the frequency of head lice in patients referring to Gerash county health center.

Methods

This descriptive cross-sectional study was conducted on patients suspected with head lice infections, who had referred to health centers in Gerash during 2011-2018. After obtaining the permission of the Research Council and the Ethics Committee of Gerash School of Medical Sciences and making coordination with Gerash health centers, if the person consented to participate in the study, the informed consent form of participation in the research project was obtained and people's demographic information questionnaires including gender, age group, place of residence, and the season of the year were completed through interviews. Then, the hair on the head, the back of the neck, and around the ears (in terms of live lice and nits) was examined in enough light by a magnifying glass and combing hair (for 2-3 minutes). Using scissors and forceps, some of the patient's hair was removed and re-evaluated with a stereomicroscope to identify and separate the various evolutionary stages of lice, including eggs, nymphs, and adult parasites. The eggs (nits) are oval in shape and white in color that stick tightly to the hair and do not separate from it. Adult lice are one millimeter to three millimeters long and range in color from gray to red. After completing the research, the data were collected and analyzed using SPSS software, version 22, and the chi-square statistical test. $P<0.05$ was considered as the level of significance.

Results

Based on the results of this study (2011-2018), a total of 66 410 patients suspected with head lice was examined, of whom 2,547 cases (3.83%) were reported with confirmed infections that consisted of 2395 female (94.03%) and 152 male (5.97%) cases. The results of the Chi-square test showed that the frequency of the head lice infection in both females and males had a statistically significant difference ($P<0.001$). In addition, a statistically significant relationship was observed in the study of the relationship between head lice infections and age in such a way that the highest levels of infections were reported in the age groups of 6-10, 7-11, and over 17 years, respectively, while the lowest level of infection was observed in the age group of under 6 years of age ($P<0.001$). Based on the findings of this study, a statistically significant difference was also observed in terms of the accommodation of the referrals so that 57.41% and 42.59% of infections were related to urban and to rural referrals, respectively ($P<0.001$). In the study and comparison of the prevalence of the head lice infection in different seasons of the year, the highest and lowest rates of infections were observed in the autumn and summer, respectively. The results of the chi-square test demonstrated a statistically significant difference between the prevalence of head lice and different seasons of the year ($P<0.001$). The data related to the amount of infections by gender, age, place of residence, and season are given in Table 1. Based on the results of this study, the level of

Table 1. Frequency Distribution of Head Lice Infection According to Gender, Age, and Season of the Year in People Referring to Health Centers in Gerash in 2011-2018

Variable		Number of Infected Cases (%)	Number of Uninfected Cases (%)	*P* Value*
Gender	Male	152 (5.97)	28684 (44.91)	< 0.001
	Female	2395 (94.03)	35179 (55.09)	
Age (y)	<6	120 (4.71)	4482 (7.02)	< 0.001
	6-10	1935 (75.97)	32659 (51.14)	
	11-17	281 (11.03)	24582 (38.49)	
	>17	211 (8.29)	2140 (3.35)	
Place of residence	City	1462 (57.40)	38384 (60.10)	< 0.001
	Village	1085 (42.60)	25479 (39.90)	
Season	Spring	314 (12.32)	8560 (13.40)	*P*<0.001
	Summer	221 (8.68)	2413 (3.78)	
	Autumn	1057 (41.50)	42049 (65.84)	
	Winter	955 (37.50)	10841 (16.98)	

Note. *Chi-square test, $P<0.05$.

infection significantly increased ($P<0.001$) so that it was 0.79% in 2011, and 0.5%, 1.03%, 2.98%, 4.43%, 4.73%, 4.98, and 11.58% from 2012 to 2018, respectively. The level of the prevalence of head lice per year is shown in Figure 1.

Discussion

Despite significant health advances in various societies, parasitic infection, including head lice, is still a health problem in poor and developing countries. According to the World Health Organization, the head lice infestation is also common in Iran.[10] The present study examined a total of 66410 patients suspected with head lice, of whom 2,547 cases (3.83%) were reported with confirmed infections consisting of 2395 female (94.03%) and 152 male (5.97%) cases. The prevalence of infection with this parasite was reported to be 11.14%, 65.7%, 2.84%, 16.3%, 72.2%, and 1.12% in epidemiological studies about the head lice infection (*Pediculus humanus capitis*) in different countries such as Turkey (in primary school girls),[14] Ethiopia (in children aged 9-11 years),[15] Brazil (in children and the elderly),[16] Poland (in youth),[17] Mexico (in children aged 10-13 years),[18] and Iraqi Kurdistan (in children 1-5 years),[19] respectively.

Studies conducted in different parts of Iran have differently reported the overall prevalence of the head lice infection in different groups of society. Saghafipour et al in the center of Iran,[3] Nazari et al in Asadabad,[20] Hazrati Tappeh et al in Urmia,[12] Alempour Salemi et al in Southeast Iran,[21] and Ebrahimzadeh Ardakani and Fayazi Bargin in Yazd[7] reported the prevalence of the head lice infection as 29.35%, 2.3%, 4%, 27.1%, and 2.6%, respectively. Such contradictions in the results of different studies can be due to differences in sampling methods, sample size, devices used for sampling, as well as accuracy in sampling and different geographical, social, economic, and cultural conditions.[22]

Like most studies conducted in Iran and elsewhere in the world, the prevalence of the head lice in females of this study was statistically more significant than that of the males.[13,23-25] Behavioral differences such as having long hair, covering the head with scarves and headdresses, and having large volumes of hair and more close head-to-head contact in girls can all contribute to the growth of head lice and the higher prevalence of infections with the parasite in females.[26,27]

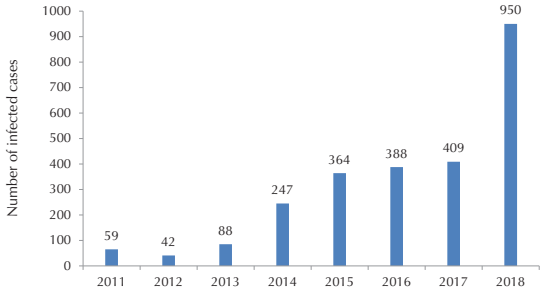

Figure 1. Frequency Distribution of Head Lice Infection by Year in Patients Referring to Health Centers in Gerash in 2011-2018.

In this study, a statistically significant relationship was observed between the head lice infection and age so that the highest and lowest rates of infection were found in the age group of 6-10 and less than 6 years, respectively. In this regard, Toloza et al investigated the prevalence of head lice in school students and showed that the prevalence of the head lice infection in students aged 6-10 years was higher compared to the other age groups.[28] In addition, the results of studies by Kassiri et al in the south of Ahvaz and Soltani & Keshavarzi in different cities of Fars province revealed a higher frequency of the head lice infection in this age group as compared to the other age groups.[10,29] It seems that the lower prevalence of head lice infection in children under 6 years of age, when compared to the other age groups, is due to the greater involvement of the family, especially the mother, in personal care of the child, including washing and hair care. On the other hand, independent behaviors related to personal hygiene and bathing begin from the age of 6-10 years when there is not enough skill and ability, but the prevalence of the head lice infection decreases by the gradual increase of age and practical skills in health care.[22]

The obtained findings from this study showed that the rate of head lice infection in urban referrals was higher when compared to rural ones, which is consistent with the results of similar studies by Moradi et al in Hamedan,[27] Abbasgholizadeh et al in Meshkinshahr,[30] and Ramezani Avval Riabi and Atarodi in Khorasan Razavi.[31] However, in most studies, including the study of Motovali-Emami et al, the prevalence of the head lice was mainly reported in rural areas,[32] which is due to the lower cultural and economic level of rural people and their lifestyle differences with urban population.[31] In addition to the economic, cultural, demographic, and geographical conditions of the studied communities, the inconsistency of the results of various studies on the prevalence of head lice infection in urban and rural areas can be due to differences in different methods used to sample and diagnose the head lice.[33] An increase in the migration of villagers to urban areas for employment or education purposes can also lead to the transmission of infections from villages to cities. Further, the simultaneous employment of parents in urban areas and the reduction of opportunities for direct care and supervision of children's health can be the other possible reasons for the higher prevalence of the head lice infection in urban areas.[31]

According to the results of the present study, the prevalence of the head lice infection had a statistically significant relationship with the season of the year so that the highest rate of infection was related to the autumn while the lowest prevalence rate belonged to the summer.

Kassiri et al also studied the epidemiology of the head lice in Ahvaz during 2010-2014 and found that the highest prevalence of the head lice infection was related to the autumn and winter.[10] Besides, in the study of Soltani and Keshavarzi, the highest and lowest rates of the prevalence of head lice infections were reported in autumn and summer, respectively.[29] The results of the present study are in line with the findings of the above-mentioned studies and most of the studies conducted in Iran and other countries. Climatic conditions such as increased rainfalls in the cold seasons of the year can be effective in intensifying the spread of infections with this parasite in the community by providing a suitable environment for lice growth and development. Furthermore, the coincidence of the beginning of the school year in Iran with the beginning of the autumn and an increase in close head-to-head contacts among the students can increase the transmission of lice among them, leading to an increase in the prevalence of infections with this parasite in the autumn. In addition, due to the cold weather of this season, most people, including students, wear warm clothes when going to work or school and then take them off and put them on special benches or shelves after reaching the intended place, which increases the indirect transmission of the lice among the individuals.[10]

In the present study, the rate of the head lice infection significantly increased from 2012 to 2018 so that this rate was reported to be 0.79% and 0.5%, 1.03%, 2.98%, 4.43%, 4.73%, 4.98%, and 11.58% in 2011, 2012, 2013, 2014, 2015, 2016, 2017, and 2018, respectively. The results of the study by Soltani and Keshavarzi on the people of Lamerd, Farashband, and Marvdasht in Fars Province also showed that the incidence of the head lice infection increased from 2012 to 2015.[29] Moreover, the findings of the study of Ramezani Avval Riabi and Atarodi in Khorasan Razavi indicated that the prevalence of the head lice infection increased from 2006 to 2010.[31] In explaining the reason for the increasing the trend of head lice infection, one can mention beginning the health transformation plan in the field of health and the widespread use of health care providers, as well as strengthening the care system, and thus increasing control and supervision in society and schools, leading to the early diagnosis of hidden infection cases. On the other hand, the main reasons for the inefficiency of health care policies and measures in controlling and reducing the incidence of the head lice infection may include the improper use of anti-lice drugs and an increase in the resistance of this parasite to existing treatments. The other main reasons were using drugs, medications, and methods whose clinical efficacy has not been proven for lice elimination, as well as not referring and seeking for treatment by infected individuals and families due to embarrassment and fear of social exclusion.[34]

Conclusion

Due to the increasing trend of the head lice infection in recent years, pediculosis is still considered a health problem, especially among students in Gerash. Therefore, to reduce head lice infection and its complications, it is recommended that health instructors provide necessary trainings on the symptoms of this infection and how to transmit it. The importance of personal hygiene and ways to prevent this disease should also be emphasized, especially in parent-teacher meetings in schools. Finally, adequate access to health services and early diagnosis and treatment can also play an important role in controlling and eliminating lice.

Study Limitations

One of the limitations of the present study was the lack of the investigation of the causal relationship between all factors affecting the incidence and spread of head lice infection, including the economic, social, and cultural status of the study population, and the effectiveness of the existing methods of lice treatment. Besides, the embarrassment of people and families with head lice and their fear of social exclusion are considered as interfering factors in the results of this study.

Conflict of Interest Disclosures

None.

Ethical Approval

This study was approved by the Research Deputy of Gerash School of Medical Sciences (Ethics No. IR.GERUMS.REC.1397.001).

Acknowledgments

This article is the result of a research project approved by the Research Deputy of Gerash School of Medical Sciences (grant No. 1020). Therefore, we would like to thank the esteemed colleagues in the Research Department of Gerash School of Medical Sciences for their financial support. We would also like to express our sincere gratitude to the staff of Gerash Health Centers.

References

1. Ghofleh Maramazi H, Sharififard M, Jahanifard E, Maraghi E, Mahmoodi Sourestani M, Saki Malehi A, et al. Pediculosis humanus capitis prevalence as a health problem in girl's elementary schools, southwest of Iran (2017-2018). J Res Health Sci. 2019;19(2):e00446.
2. Moemenbellah-Fard M, Nasiri Z, Azizi K, Fakoorziba MR. Head lice treatment with two interventions: pediculosis capitis profile in female schoolchildren of a rural setting in the south of Iran. Ann Trop Med Public Health. 2016;9(4):245-50. doi: 10.4103/1755-6783.184790.
3. Saghafipour A, Nejati J, Zahraei Ramazani A, Vatandoost H,

Mozaffari E, Rezaei F. Prevalence and risk factors associated with head louse (*Pediculus humanus capitis*) in Central Iran. Int J Pediatr. 2017;5(7):5245-54. doi: 10.22038/ijp.2017.23413.1967.
4. Badiaga S, Brouqui P. Human louse-transmitted infectious diseases. Clin Microbiol Infect. 2012;18(4):332-7. doi: 10.1111/j.1469-0691.2012.03778.x.
5. Kassiri H, Feizhaddad MH, Abdehpanah M. Morbidity, surveillance and epidemiology of scorpion sting, cutaneous leishmaniasis and pediculosis capitis in Bandar-Mahshahr county, southwestern Iran. J Acute Dis. 2014;3(3):194-200. doi: 10.1016/s2221-6189(14)60043-3.
6. El-Sayed M, Toama M, Abdelshafy A, Esawy A, El-Naggar S. Prevalence of pediculosis capitis among primary school students at Sharkia Governorate by using dermoscopy. Egypt J Dermatol Venerol. 2017;37(2):33-42. doi: 10.4103/ejdv.ejdv_47_16.
7. Ebrahimzadeh Ardakani M, Fayazi Bargin MH. Prevalence of pediculosis capitis in Yazd primary schools in 2013. Journal of Health. 2018;8(5):587-95. [Persian].
8. Catalá S, Junco L, Vaporaky R. *Pediculus capitis* infestation according to sex and social factors in Argentina. Rev Saude Publica. 2005;39(3):438-43. doi: 10.1590/s0034-89102005000300015.
9. Tufail M, Khan M, Hassan I. Prevalence of pediculosis among students in Pakistan. Arch Med. 2017;9:2. doi: 10.21767/1989-5216.1000207.
10. Kassiri H, Farhadinejad R, Lotfi M. Investigation of the prevalence of head lice (*Pediculus capitis*) in the west of Ahvaz county, southwestern Iran: adescriptive- analytical study. Indo Am J Pharm Sci. 2017;4(11):4263-71. doi: 10.5281/zenodo.1057029.
11. Akbari M, Bagheri A, Moradi M, Rafinejad A, Rafinejad J. Head lice among Iranian elementary school children: a systematic review. J Biostat Epidemiol. 2017;3(3-4):111-6.
12. Hazrati Tappeh K, Chavshin A, Mohammadzadeh Hajipirloo H, Khashaveh S, Hanifian H, Bozorgomid A, et al. Pediculosis capitis among primary school children and related risk factors in Urmia, the main city of West Azarbaijan, Iran. J Arthropod Borne Dis. 2012;6(1):79-85.
13. Nejati J, Keyhani A, Tavakoli Kareshk A, Mahmoudvand H, Saghafipour A, Khoraminasab M, et al. Prevalence and risk factors of pediculosis in primary school children in South West of Iran. Iran J Public Health. 2018;47(12):1923-9.
14. Öncü E, Vayısoğlu SK, Güven Y, Önen E, Bulut ER, Cekic H, et al. The prevalence of pediculus capitis in primary schools in a city of Turkey and the efficacy of health education in treatment. Med Sci (Turkey). 2018;7(3):469-75. doi: 10.5455/medscience.2018.07.8840.
15. Dagne H, Biya AA, Tirfie A, Yallew WW, Dagnew B. Prevalence of pediculosis capitis and associated factors among schoolchildren in Woreta town, northwest Ethiopia. BMC Res Notes. 2019;12(1):465. doi: 10.1186/s13104-019-4521-8.
16. Nunes SCB, Moroni RB, Mendes J, Justiniano SCB, Moroni FT. [Head lice in hair samples from youths, adults and the elderly in Manaus, Amazonas State, Brazil]. Rev Inst Med Trop Sao Paulo. 2015;57(3):239-44. doi: 10.1590/s0036-46652015000300010.
17. Tytuła A, Bartosik K, Jasztal-Kniażuk A, Buczek W, Błaszkiewicz A, Borzęcka-Sapko A. Analysis of the prevalence of pediculosis and scabies in orphanages and refugee shelters in south-eastern Poland. J Educ Health Sport. 2019;9(3):493-500. doi: 10.5281/zenodo.2605743.
18. Laguna-Aguilar M, Sánchez-Casas RM, Díaz-González EE, Del Río-Galván S, Hernández-Escareño JJ, Fernández-Salas I. Prevalence and risk factors of pediculosis in children of the Lacandon Jungle in Chiapas, Mexico. Salud Publica Mex. 2018;60(4):383-4. doi: 10.21149/8909.
19. Ali FM, Hama AA. Prevalence of head Pediculosis among refugees in Sulaimani Governorate/Kurdistan-Iraq. Iraqi J Sci. 2018;59(2C):1012-8. doi: 10.24996/ijs.2018.59.2C.4.
20. Nazari M, Goudarztalejerdi R, Anvari Payman M. Pediculosis capitis among primary and middle school children in Asadabad, Iran: an epidemiological study. Asian Pac J Trop Biomed. 2016;6(4):367-70. doi: 10.1016/j.apjtb.2016.03.002.
21. Alempour Salemi J, Shayeghi N, Zeraati H, Akbarzadeh K, Basseri H, Ebrahimi B, et al. Some aspects of head lice infestation in Iranshahr area (southeast of Iran). Iran J Public Health. 2003;32(3):60-3.
22. Maleky A, Yazdani-Charati J, Abdollahi F. The prevalence of pediculosis capitis and its associated risk factors in primary school students in Kalaleh, Iran in 2015. Journal of Health Research in Community. 2016;2(3):23-31. [Persian].
23. Chourabi M, Brahim D, Bonnard C, Aounallah A, Ng AY, Tohari S, et al. A novel nonsense *ATP2C1* mutation causes Hailey-Hailey disease in a Tunisian family. Our Dermatol Online. 2018;9(2):110-3. doi: 10.7241/ourd.20182.1.
24. Moradiasl E, Habibzadeh S, Rafinejad J, Abazari M, Ahari SS, Saghafipour A, et al. Risk factors associated with head lice (pediculosis) infestation among elementary school students in Meshkinshahr county, North West of Iran. Int J Pediatr. 2018;6(3):7383-92. doi: 10.22038/ijp.2018.27961.2420.
25. Manrique-Saide P, Pavía-Ruz N, Rodríguez-Buenfil JC, Herrera Herrera R, Gómez-Ruiz P, Pilger D. Prevalence of pediculosis capitis in children from a rural school in Yucatan, Mexico. Rev Inst Med Trop Sao Paulo. 2011;53(6):325-7. doi: 10.1590/s0036-46652011000600005.
26. Noori A, Ghorban Pour M, Adib M, Noori AV, Niazi S. Head lice infestation (pediculosis) and its associated factors in the rural school students of Kalaleh, in the academic year 1392-93. Jorjani Biomed J. 2014;2(1):60-56. [Persian].
27. Moradi A, Bathaii SJ, Shojaeian M, Neshani A, Rahimi M, Mostafavi E. Outbreak of pediculosis capitis in students of Bahar in Hamedan province. Dermatology & Cosmetic. 2012;3(1) 26-32. [Persian].
28. Toloza A, Vassena C, Gallardo A, González-Audino P, Picollo MI. Epidemiology of pediculosis capitis in elementary schools of Buenos Aires, Argentina. Parasitol Res. 2009;104(6):1295-8. doi: 10.1007/s00436-008-1324-6.
29. Soltani Z, Keshavarzi D. Increasing trend of pediculosis (*Pediculus humanus* Capitis) in Lamerd, Farashband, and Marvdasht cities, Southern Iran. Int Arch Health Sci. 2018;5(2):38-42. doi: 10.4103/iahs.iahs_36_17.
30. Abbasgholizadeh N, Moradi-Asl E, Adham D, Soudi R, Ganji A, Brije H, et al. Prevalence of head lice infestation (pediculosis capitis) among primary school students in the Meshkin Shahr of Ardabil province. Am J Pediatr. 2018;4(4):94-9. doi: 10.11648/j.ajp.20180404.14.
31. Ramezani Awal Riabi H, Atarodi A. Epidemiological and clinical study of infested cases with pediculus capitis and *P. corporis* in Khorasan-e-Razavi, Iran. Iran J Parasitol. 2012;7(1):85-91.
32. Motovali-Emami M, Aflatoonian MR, Fekri A, Yazdi M. Epidemiological aspects of pediculosis capitis and treatment evaluation in primary-school children in Iran. Pak J Biol Sci. 2008;11(2):260-4. doi: 10.3923/pjbs.2008.260.264.
33. Dehghanzadeh R, Asghari-Jafarabadi M, Salimian S, Asl Hashemi A, Khayatzadeh S. Impact of family ownerships, individual hygiene, and residential environments on the prevalence of pediculosis capitis among schoolchildren in urban and rural areas of northwest of Iran. Parasitol Res. 2015;114(11):4295-303. doi: 10.1007/s00436-015-4670-1.
34. Mumcuoglu KY, Gilead L, Ingber A. New insights in pediculosis and scabies. Expert Rev Dermatol. 2009;4(3):285-302. doi: 10.1586/edm.09.18.