

# A Review of Pediculosis Studies in Iran During Three Decades (1990-2020)

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**Received:** 10 July 2021

**Revised:** 16 August 2021

**Accepted:** 11 September 2021

## Abstract

**Background:** Lice are obligate parasites that bring about some mild infestation or severe diseases on different parts of the human body. Head lice can easily spread in an overcrowded community with inadequate hygienic conditions. Also, it affects children's well-being and education programs.

**Methods:** This study is a narrative review. To carry out this comprehensive research about pediculosis in Iran, all published data on scientific research resources were included i.e. Google scholar, Springer, ProQuest, JSTOR, Scopus, Web of Science, EBSCO, Bioline, BioOne, ScienceDirect, ResearchGate, PubMed, Sage, Wiley Online Library, World Scientific, and SID.

**Results:** Overall, 52,342 students (from primary and secondary schools) and around 20,000 adult persons were infested with *P. capitis* in Iran during 3 decades (1990-2020) as reported by published documents but the actual number may statistically be higher. The variation of results implies that risk factors are linked with numerous cultural, geographical, economic, and personal habits. In general, the infestation rate of *Pediculosis capitis* in the south and southeast was higher than in other parts of Iran.

**Conclusion:** Family members should avoid sharing hair tools particularly hairbrushes. Authors believe that not only economic situations but also some behaviors originating from personality traits influenced children's health. In this regard, children in higher grades might tend to conceal their infestation from their parents or school nurse care. Wet combing is often efficient for removing nits at least within the initial infestation.

Please cite this article as: Khosravani M, Ali Amiri S, Rafatpanah A, Bandak C, Latifi R, Moradi M, Mohebbi N, Abdollahi Harat F, Mohebbi Nodez SM, Hatami Z. A Review of Pediculosis Studies in Iran During Three Decades (1990-2020). *J Health Sci Surveillance Sys*. 2021;9(4):218-225.

**Keywords:** Hair, Infestation, Iran, Pediculosis, Students

## Introduction

Pediculosis refers to any louse infestation on the head (hair shaft and scalp), body, or pubic area of a human. *Pediculosis humanus capitis*, *Pediculosis humanus corporis*, and *Pthirus pubis* are three forms causing this complication.<sup>1,2</sup> Female *P. capitis* prefers to lay eggs

around ears and the nape of the neck while attaching to the hair shaft. Nymph that hatches out of nits grows up into an adult within 1 week. They feed on the head every 4 to 6 hours over an average lifespan of 16 days.<sup>3</sup> Pruritus is the fundamental symptom of infestation. Sometimes in the intensive infestation, secondary infection with impetigo pyoderma and lymph nodes are involved

as well.<sup>4</sup> Infestations are indirectly spread by sharing clothes, beds, and personal items of infested persons or direct head contact under poor hygiene.<sup>5</sup> Moreover, the progression of this infestation depends on numerous variables such as age, sex, family size, the level of parent education, length, and hair condition.<sup>6</sup> Now, head louse infestation is a health and sometimes a psychological challenge for school children. The scope of this review draws the newest outcome from all available data about pediculosis and its main points in Iran. We focus on predisposing subjects, the current state of pediculosis, and challenges in treatments. This study brings more knowledge and a broader delineation of socioeconomic components relevant to pediculosis. Besides, our finding might be useful to support school children's health and well-being.

## Methods

Several repositories were used to achieve the aim of this review including Google scholar, Springer, ProQuest, JSTOR, Scopus, Web of Science, EBSCO, BioOne, ScienceDirect, ResearchGate, PubMed, Sage, Wiley Online Library, World Scientific, and SID. We applied various keywords such as pediculosis, head lice, epidemiology, treatment, school children, and Iran to have access to more research papers on our topic in Persian and English languages. Moreover, the researchers did not limit their search to specific time or year. Abstracts were checked to see whether the articles had relevant factors; then irrelevant articles were removed. Selected articles were read thoroughly evaluating methodology, results, and other sections. In this regard, we focused on all three developmental stage of lice (nit, nymph, and adult), leading to infestation. According to scientific criterion, nits should be found in the hair of cases with a distance equal or smaller than 1.4 inches from the scalp. Lack of eggs and lice on respondents' hair and the presence of nits with a distance greater than 1.4 inches from the scalp even after combing was accounted the previous infestation.

## Results

### Epidemiology

Approximately, *Pediculosis capitis* is prevalent in all regions of Iran. Moreover, most of the researches have been carried out at the level of county among students. Notably, the infestation rate of *Pthirus pubis* is unclear. *Pediculosis humanus humanus* (*P. corporis*) was observed in some prisons but data were insufficient to analyze factors of pediculosis. Therefore, the current study focused on head lice more than any other species.

### *Pediculus Humanus Capitis* (Head Louse)

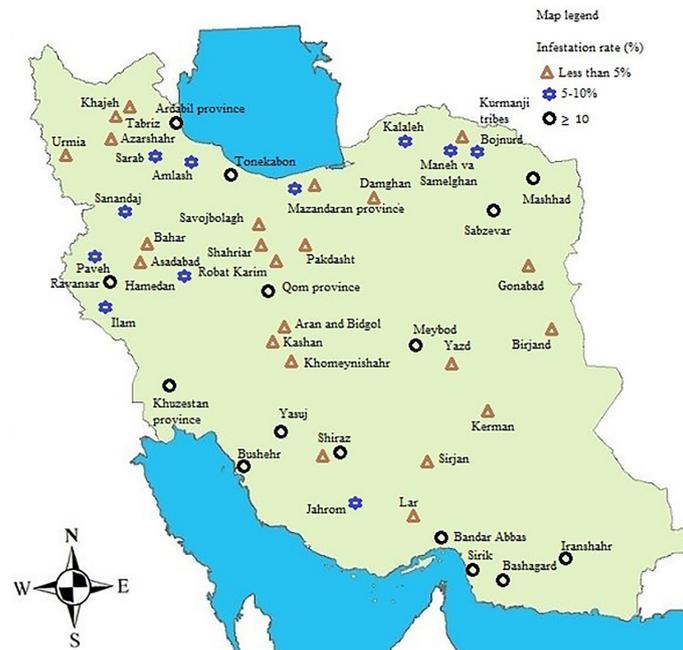
The infestation rate of head louse was 6.85 in Hamedan (in the west of Iran) in primary school

students.<sup>7</sup> *P. capitis* infestation was less than 5% in students (disregarding their age) in Aran and Bidgol, Azadshahr, Birjand, Pakdasht, Khajeh City, Babol, Savojbolagh, Tabriz, Gonabad, Asadabad, Shiraz, Khomeynishahr, Kerman, Sirjan, and Urmia.<sup>8-22</sup> In some districts of Khuzestan province, the head lice infestation was 10.5% in primary school children.<sup>23</sup> Almost, 0.73% of age groups were involved with lice infestation in Khorram-shahr county located in this province.<sup>24</sup> Generally, an infestation of 3.2% was seen among adults and children in North Khorasan province.<sup>25</sup> This index was higher than 40% among people (students and nonstudents) based on ages categories in Ahvaz city, in the southwest of Iran.<sup>26</sup> Health care staff and physicians examined patients referred to a hospital in Mashhad; 5.45% of them were diagnosed with head louse infestation.<sup>27</sup> Ninety-five individuals out of all people who referred to the Azna clinical and health centers hosted head lice.<sup>28</sup> The infestation rate in kindergartens in Rasht city was around 4.65%.<sup>29</sup> Published articles about secondary and middle schools were rare. About 1% of secondary school students had an experience of *P. capitis* in Hamedan.<sup>30</sup> Eleven percent of primary school pupils became involved with head lice in Yasuj, 9.20% in primary schools (boys and girls) in Amlash, 5.74% in Tonekabon, 12.17% in Sabzevar, 12% in Bushehr, 27.12% in Bandar Abbas, 6.8% in Jahrom, 5.5% in Ilam, 0.66% in Bahar, 2.6% in Yazd, 5.9 % in Sarab, 20% in Ardabil province, 6.5% in Kalaleh, 5.7% in Glugah, 1.8% in Mazandaran province, 10% in Maneh-va Semelghan, 10.25% in Meshkinshahr, 0.70% in Kashan, and 7.7% in Bojnurd.<sup>31-49</sup> In a study conducted in 1999 in Shiraz, only 16.5% of female students had contamination.<sup>50</sup> In the parallel data that solely performed about female students 1.25%, 3.6%, 3.93%, 4.8%, 7.7%, 7.9%, 8%, 13.3%, 13.6%, 15.8%, 17.4%, 19%, 23.38%, 27.1%, 56.15 %, and 67.3% became entangled with head lice infestation in Robat Karim, Damghan, Lar, Shahriar, Sanandaj, some parts of the north of Iran (Galugah, Ramsar and Savadkuh districts), Paveh, Qom province, Mashhad, Ravansar, Meybod, Tonekabon, Karoon (southwest), Iranshahr, Sirik, and Bashagard respectively.<sup>51-66</sup> Incredibly, the infestation was a more serious health challenge in the central prison of Hamadan since 85% of prisoners were diagnosed with head lice.<sup>67</sup> Similarly, this prevalence reached 9% in Bandar Abbas prison, 5.1% in Rasht Lakan prison, and 4.6% in the central prison of Kerman.<sup>68-70</sup> Rahnama and Kamyabi 2001 demonstrated that 31.6% of Afghanistani immigrants living in the camp suffered from *P. capitis*.<sup>71</sup> In general, the infestation rate of *Pediculosis capitis* in the south and southeast was higher than in other parts of Iran (Figure 1 and Table 1).

### Etiology

#### Gender and Age

As expected, female individuals were more involved with pediculosis than male ones in Iran.



**Figure 1:** The geographical pattern of *Pediculosis capitis* in the primary schools (regardless of gender) identifying how it has been spread in Iran from 1990 to 2020.

**Table 1:** Distribution of *Pediculosis capitis* in Iran from 1990 to 2020

Infestation rate (%)	Site by province	Researcher and time of study
Less than 5%	Isfahan: Aran and Bidgol, Kashan, Khomeynishahr East Azerbaijan: Azarshahr, Khajeh, Tabriz South Khorasan: Birjand Tehran: Pakdasht, Robat Karim, Shahriar Mazandaran: Babol, Galugah, Miandorud, Neka, Sari, Babolsar, Mahmudabad, Ramsar, Kiakola, Amol, Chalus, Qaemshahr Kerman: Sirjan, Kerman West Azerbaijan: Urmia Alborz: Savojbolagh Razavi Khorasan: Gonabad Hamedan: Asadabad, Bahar Fars: Shiraz, Lar North Khorasan: Kurmanji Tribes Semnan: Damghan Yazd: Yazd	Doroodgar et al., 2014; Motevalli Haghi et al., 2014; Lashkari et al., 2020; Davari et al., 2013; Shayeghi et al., 2010; Zabihi et al., 2005; Bahrami et al., 2016; Hodjati et al., 2008; Ramezani Awal Riabi and Atarodi, 2012; Nazari et al., 2016; Kalari et al., 2019; Motavali Emami, 2003; Kamiabi and Nakhaei, 2005; Yousefi et al., 2012; Hazrati Tappeh et al., 2012
5-10 (%)	Hamedan: Hamedan Gilan: Amlash Fars: Jahrom Mazandaran: Tonekabon, Galugah, Ramsar, Savadkuh Ilam: Ilam East Azerbaijan: Sarab Golestan: Kalaleh North Khorasan: Maneh va Samelghan, Bojnurd Kurdistan: Sanandaj Kermanshah: Paveh	Nazari and Saidijam, 2007; Rafinezhad et al., 2006; Modaresi et al., 2013; Majidi et al., 2017; Gholami Parizad and Abedzadeh, 2002; Dehghanzadeh et al., 2015; Maleky et al., 2016; Kassiri and Esteghali, 2016; Hosseini et al., 2014; Rajabzade et al., 2014; Yaghmaei et al., 2007; Moosazadeh et al., 2019; Vahabi et al., 2013
≥10 (%)	Khuzestan province: Nomadic tribes of Andimeshk, Dezful, and Shoosh, Karoon Kohgiluyeh and Boyer-Ahmad: Yasuj Razavi Khorasan: Sabzevar, Mashhad Bushehr: Bushehr Hormozgan: Bandar Abbas, Sirik, Bashagard Ardabil: Ardabil, Meshkinshahr, Namin, Khalkhal, Sareyn, Nir, Germe, Kowsar, Parsabad, Bilehsavar Fars: Shiraz Yazd: Meybod Mazandaran: Tonekabon Sistan and Baluchestan: Iranshahr Qom province Kermanshah: Ravansar	Nejati et al., 2018; Shahraki et al., 2001; Tarkhasi et al., 2018; Argmand Zadeh et al., 2001; Soleymanizadeh and Sharifi Sarasiabi, 2002; Adham et al., 2020; Moradiasl et al., 2018; Ghavanini et al., 1999; Morovati Sharif Abadi et al., 2018; Heidarpoor et al., 2019; Ghofleh Marmazi et al., 2019; Alempour Salemi et al., 2003; Sanei-Dehkordi et al., 2017; Soleimani-Ahmadi et al., 2017; Noroozi et al., 2013; Mohammadia et al., 2019; Sayyadi et al., 2013

A study conducted in Asadabad showed that the prevalence of female students was 6 times greater than male students in primary schools.<sup>17</sup> In Bojnurd, the infestation rate in males was 4 times higher than females.<sup>49</sup> On the contrary, head lice infestation was not related to gender in Sirjan.<sup>21</sup> In other investigations, we also observed that girls were affected 3-8 times greater than the opposite sex. In various studies performed only on female school children, the rates of contamination ranged from 1.25 to 56.15%. Pediculosis significantly affected 6-15- year-old students. Notably, children younger than 7 at kindergarten were more involved with head lice.<sup>29</sup> In a camp for Afghanistani refugees, children younger than 10 years old were more affected.<sup>71</sup> When assessing pediculosis among adult individuals, the researchers of the current study found that the 20–29 age group was mostly affected in Mashhad<sup>27</sup> while, in the central prison of Hamadan, 30-39 age group was mostly affected although a statistically significant relationship was not found.<sup>67</sup>

#### *School Grades*

The mechanism of infestation was not the same in students according to the class degree. Primary school first graders showed the infestation rate of 27%, 15.5% (girls), and 1.6% in Azadshahr, Qom province, and Bahar respectively.<sup>9, 58, 39</sup> The infestation rate was higher in second graders although there was no significant correlation between infestation and the students' grade in Savojbolaq county.<sup>14</sup> Prevalence of head lice had a higher peak in the females in fifth grade in Yasuj and Damghan also higher grade led to higher infestation rate in both males and females in Sirjan.<sup>21</sup> Notably, this situation wasn't observed in male students.<sup>31, 51</sup> Other researches have shown different results in different age groups in Iran. Assumingly, children in the lower age category cannot take care of themselves very well; whereas children in higher grades may tend to conceal their infestation from their parents or health teachers. children are often careless about keeping their safety; therefore, the infestation rate is higher in such grades. Moreover, the head louse was mostly observed in primary schools in comparison with secondary or middle schools in Pakdasht county.<sup>11</sup> In contrast, *P. capitis* was more prevalent in female students of middle schools in Khomeynishahr.<sup>19</sup>

#### *Family Size and Densely Populated Areas*

This factor also had various models. Families with a medium size (5-7 members) had higher levels of prevalence even higher than that of crowded families in the southwest of Iran.<sup>63</sup> A similar pattern was presented in Kerman.<sup>20</sup> In contrast, 71.2% of patients belonged to overcrowded families (>8 individuals) in the south of Iran.<sup>65</sup> Large families which exist in some

regions of Iran have no separate room per person and they don't have access to appropriate sanitation. In such families, children of the opposite or same-sex share a bedroom so they spend the majority of time together and use personal belongings such as a towel, blanket, comb, hat, etc. Results exhibited that children who had private rooms were safer from pediculosis in comparison with others sharing rooms or beds with siblings.<sup>62, 72</sup> In prison, the circumstance was worse. Studies showed that communicable diseases such as pediculosis and scabies have been transmitted simultaneously from person to person through poor-hygiene practices in some prisons and camps in Iran.<sup>68</sup>

#### *Personal Hygiene*

We could keep ourselves away from pathogens by hygiene practices. Washing hair, using private bathroom, and separated beds can prevent the prevalence of infectious diseases especially in crowded places. Some studies showed that the infestation rate was lower in female students who washed their hair at least three times a week.<sup>57, 60</sup> Also, sharing comb, hat, bedroom, toys, scarf, and towels caused higher infestation in students.<sup>42, 57, 66</sup> Ironing the clothes and using the washing machine were strongly associated with lower *P. capitis* prevalence.<sup>42</sup> These findings agree with supplementary information that mentioned elementary school students who shared sanitary tools with others and did not take a bath frequently had higher head lice infestation.<sup>48</sup> However, there was no remarkable link between the frequency of coming or bathing with the infestation in primary schools in Yazd city, Iran.<sup>40</sup>

#### *Hairstyle and Length*

A study conducted in Mashhad revealed that students with straight hair had a higher infestation rate than female students with curly hair.<sup>59</sup> Hazrati Tappeh et al. 2012 stated that *P. capitis* infestation mostly affected males and females with longer hair.<sup>22</sup> However, another research depicted that females had infestation regardless of their hair length, hair type and style.<sup>62</sup> It should be clarified that there were no exact criteria for describing hair length in documents. Hair length more likely depends on cultures and local attitudes. Generally, when hair reaches the armpit, it is considered long while the hair length is considered medium in most parts of Iran when it reaches the shoulder. The original hair color, dandruff, and braided hair had no relationship with pediculosis infestation but there was a connection with length and hairstyle in female students in Amlash.<sup>32</sup> Based on the odds ratio (OR), short hair was a risk factor for *P. capitis* infestation (nits stage) in students. Researchers mentioned that some students had a trim at the time of visual inspection for seeking nits while they already had long hair with an infestation.<sup>61</sup>

Another survey revealed that infestation was higher in students applying hair oil but dandruff, braided hair, and length did not correlate with infestation.<sup>64</sup> Moreover, the infestation was greater in children who did not use personal hair tools and supplies needed for having a haircut at hair salons.<sup>54</sup>

#### Economic Items

There was no strong link between monthly income and the prevalence of pediculosis in a study carried out in urban areas of Jahrom county, in the south of Iran.<sup>37</sup> Conversely, a relationship was presented between income and pediculosis in Zabol, in the east of Iran.<sup>73</sup> On the other hand, students who did not have a bath in their house had a higher risk of infestation by head lice in remote rural locations of Ilam province.<sup>38</sup> Having access to the bathroom had many benefits for keeping children healthier in terms of infestation.<sup>44, 48</sup> *P. capitis* was more common in elementary school students whose homes were built of mud in Khajeh county.<sup>12</sup>

#### Residence

There was a gap between the prevalence of pediculosis in impoverished and urban areas in Iran. The students from countryside were more affected than those residing in cities and urban areas.<sup>23, 50</sup> The infestation rate for *P. capitis* in rural and urban patients was 59.2% and 40.8% respectively in Khorram-shahr district.<sup>24</sup> But female students who lived in cities were exposed to head lice two times higher than villages in the north of Iran.<sup>56</sup> Research showed that cities were mainly affected by head lice in the north and west of Iran.<sup>30, 50</sup> Some studies were implemented in marginal urban zones with low socio-economic and welfare states. These places are occupied by local immigrants in high density. Nearly, 21.5% of people who inhabited in rent houses with poor sanitation that located in lower-class part of the Birjand city had an infestation of *P. capitis*.<sup>10</sup> Since they are originally from other regions, they travel to hometowns to visit their relatives. Therefore, transmission of pathogen happens doubtlessly.

#### Environmental Condition

Head louse infestation in the autumn season happens with higher rates in some parts of Fars and Ardabil provinces as well as the Gonabad region.<sup>74</sup> Infestation was reported to happen more frequently in winter in Ahvaz.<sup>26</sup> Students were affected by head lice in march and May in Sabzevar county.<sup>34</sup> Infestation to head lice was more prevalent in areas of Ardabil province at an altitude above 1500 meters with an annual temperature range (14-16.5 °C).<sup>42</sup>

#### Conclusion

Overall, 52,342 students (from primary and secondary

schools) and around 20,000 adult persons were infested with *P. capitis* in Iran during 3 decades (1990-2020) as reported by published documents but the actual number may be statistically higher. Infested people are certainly higher than these statistics because many areas haven't been studied and their information has not been published yet. As we mentioned, pediculosis is not only a physical health problem but also a potential social challenge. The heterogeneity of results implies that risk factors are linked with numerous cultural, geographical, economic, and personal habits items. For instance, Tonekabon (a county in the north) or Shiraz (in the south) had two different dynamics of *Pediculosis* at two specific times. It means that an area may be heavily involved at a distinct period, while it is minimally involved at another time. Authors believe that not only economic situations but also some behaviors originating from personality traits influenced children's health. In this regard, children in higher grades may tend to conceal their infestation from their parents or health teachers. It should be mentioned that hygiene practices and housing has been improved over time in rural communities and public places such as schools, prisons, and other public areas in Iran. Indeed, prisoners receive qualified care from health personals but in some remote areas, people don't have access to safe water for bathing yet. Hair salons should be regularly inspected by health care staff. Also wet combing is often efficient for removing nits at least within initial infestation. Nowadays, natural products such as essential oils could be employed as alternative methods.

**Conflict of Interest:** None declared.

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