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Assessment of Faculty Students' Awareness about "Pediculosis" in Najaf Province, Iraq

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ABSTRACT

Introduction: Pediculosis is a common health problem. Many studies had implemented to show prevalence of head lice infestation, but assessment of knowledge and awareness level regarding it, had never been studied in Najaf. The present study designed to be the first investigation at this topic.
Objectives & Methods: Questionnaires were answered by 300 biology department students their ages (18-24) years during February-May in 2020 in Najaf Province. Multinomial regression models were used to analyze the predictor variables of pediculosis students' knowledge.
Results: Out of 300 participants included, (98%) correctly answered about prevention & eradication, (88.0%) about infectivity aspects which considered a good informative level. Moderate level of information about lice biology (71.3%), transmission and clinical features (64.3%). While infestation likelihood (58.3%), and treatment (52.3%) aspects appeared mild awareness level toward pediculosis, lice survival aspects (40.5%) showed a weak knowledge level. (82.3%) of the participants felt ashamed if their child/ren or family member/s infested with pediculosis.
Conclusions: The overall percentage of correct answers was about 67.13%, it is substandard knowledge level regarding pediculosis in the present study.

Keywords: Assessment, knowledge, head lice, pediculosis, Najaf.

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INTRODUCTION

Pediculosis is parasitic skin disease, the causative agent is human head lice (*Pediculus hominis capitis*) that are usually host-specific and are extremely well-adapted ectoparasitic insects [1], that cause significant distress to affected children and their families [2]. Infestation causes irritation, pruritus, discomfort & secondary bacterial infections [3,4]. It occurs almost in school age children, refugees and homeless people, and slum dwellers, in spite of, its possible spread in all socioeconomic strata globally [5].

Pediculosis is endemic in many developing countries and epidemics occur in the western world such as Europe [6]. Poverty, illiteracy, rural communities' distance and displacement increase the possibility of infestation anywhere; Iraq has no exception to this trend. Prevalence of pediculosis among Iraqis varies widely by region, reaching 24.08%, 14%, 34.7% & 1.12% [7,8,9,10] respectively. Lice prevalence due to lice biology, misuse of medication or drug resistance, explains recurrent minor outbreaks and fails to eradicate the infestation [11]. Some communities consider head lice infestation is a stigma [2,12]. In some developed countries, pediculosis consumes essential resources from health care institutions [13].

Previous studies of head lice have primarily focused on aspects of insect biology, epidemiology, lousicides efficacy & phylogeny [1,5,14], studies on a community knowledge, practices & attitudes against head lice infestations are little and limited. The better strategy to spread information of head lice prevalence, the more prevention or at least shortage the infestations because the lack of awareness almost leads to incorrectly dealt with, misdiagnosis and/or misuse of pediculicides; the effect of increasing resistance to the medications used for treatment [15]. Hence, the current study aims to highlight the level of knowledge of pediculosis phenomena by students of Faculty of Education for Girls in University of Kufa in Najaf/ Iraq.

Objectives & Methods

Study Design: A cross-sectional, college students' knowledge-based study toward pediculosis was conducted from February-May in 2020 in Al-Najaf Province, which situated in the central-south Iraq, about 160 km south of Baghdad. The questionnaires were distributed to more than 300 students of Faculty of Education for Girls/ Department of Biology, their ages (18-24) years. They were sent to the participants on network through Google Classroom application due to medical situation and curfew for pandemic of Covid-19, with response format of "Correct", "Incorrect" or "I do not know", lasted ~ 40 min to assess awareness regarding head lice infestation. The main questionnaire included information about the lice, transmission, correct methods of identifying, prevention and medication. These questionnaires were pre-tested by medical professionals in family medicine and dermatologist, for their phrases structure, reliability and time allotment.

Ethics Statement: Consent for the investigation was approved prior to data collection. All subjects were told that participation in the study was voluntary and that the collected data would only be used for scientific research. The objectives were asked to answer the questionnaire by their own information about the issue with no help among them nor global networking. Some uncompleted questionnaires were neglected.

Data analysis: Data were obtained from the participants as a voluntary assignment using Google Form application. Multinomial logistic regression models were used to analyze the predictor variables (lice biology, survival, transmission, infestation likelihood, clinical features, infectivity & treatment). Statistical significance was assumed at $p<0.05$. Statistical analyses were performed using the Statistical Package for Social Science Software, version 24 (Inc., Chicago, Illinois, USA).

Results & Discussion

Investigations on knowledge, attitudes, and practices regarding head lice infestations are limited in Iraq. The current study is conducted to show knowledge of women "whom mainly responsible for health caring of their household members" toward pediculosis. Some socio-demographic characteristics of the study samples are listed in Table (1).

Table1: Characteristics of selected students included in the survey (*n*=300).

Parameters	No.	%
Residency		
-Urban	182	60.7
-Rural	118	39.3
Marital Status		
-Married	114	38
-Unmarried	186	62
No. of Children*		
1	64	56.1
> 1	17	14.9
None	33	29

* n=114

The main results of this study illustrated in Tables (2 &3), the overall level of knowledge was 63.9%; which can be determined as rather acceptable level especially that related to prevention, infectivity & head lice biology aspects; that may be explained that the study participants were biologists. While parental knowledge of head lice was found to be very limited in Jordon [16].

Table 2: Statements regarding pediculosis answered by students (*n*=300).

Categories & Statements (Responses)		Answers no. (%)		
		Correct	Incorrect	Don't know
1a[1]	Head lice are insects (T).	252(84)	48(16)	0
2a	Head lice can fly and jump from person to another (F).	167(55.7)	123(41)	10 (3.3)
3a	The head lice feed on sucking blood from scalp (T).	285(95)	15(5)	0
4d	Head lice may infest the individual more than one time (T).	255(85)	38(12.7)	7(2.3)
5b	The louse dies within 48-72 h, if it falls off a person's head (T).	107(35.7)	132(44)	61(20.3)
6b[1]	In active pediculosis, it's possible to see some lice on nape of neck or on the collar (T).	136(45.3)	141(47)	23(7.7)
7e	Scratching of the scalp is frequent symptom of head lice infestation (T).	235(78.3)	65(21.7)	0
8e	Scratching of the scalp leads to secondary infection (T).	117(39)	135(45)	48(16)
9a	There is more than one species of lice can infest human (T).	151(50.3)	134(44.7)	15(5)
10c	Pediculosis is a zoonotic disease (F).	130(43.3)	146(48.7)	24(8)
11c[1]	Head lice can infest human from pets or farm animals (F).	139(46.3)	126(42)	35(11.7)
12d	Head lice spread in developing countries only (F).	105(35)	156(52)	39(13)
13d	Infestation likelihood between boys and girls is equal (T).	129(43)	162(54)	9(3)
14d[1]	Head lice infestation is more prevalent in winter (T).	211(70.3)	86(28.7)	3(1)
15c	The main mode of transmission is prolonged direct contact (T).	276(92)	24(8)	0
16c	Sharing infested brushes, combs, pillows and clothes does not result in transmission (F).	300(100)	0	0
17h[1]	During infestation, all the bedding and clothing which used by infested child should be washed with hot water and exposed to sunray (T).	294(98)	4(1.3)	2(0.7)
18c	Head lice infestation is always a sign of poor hygiene and health care (F).	119(39.7)	171(57)	10(3.3)
19f[1]	Almost, pediculosis is not a life-threating disease (T).	288(96)	10(3.3)	2(0.7)
20e[1]	Nits and dandruff can be differentiated (T).	227(75.7)	70(23.3)	3(1)
21f	Head lice infestation transmit another infectious agent (T).	240(80)	47(15.7)	13(4.3)
22g	Lousicidal products can be obtained over the counter (T).	257(85.7)	9(3)	34(11.3)
23g[1]	All the available medications are effective against lice & nits (F).	91(30.3)	197(65.7)	12(4)
24g	Health care provider should be asked about the suitable medication if the child has allergies, asthma and other medical conditions (T).	37(12.3)	180(60)	83(27.7)
25g	Using the lice combs, enough to eradicate the infestation (F).	243(81)	56(18.7)	1(0.3)
26	Do you feel shame of your child/family member infestation with pediculosis?	247(82.3)	51(17)	2(0.7)
27	Do you feel ashamed when you seek health care from a doctor or pharmacist?	231(77)	69(23)	0
28	Do/did you ever join an educational session about pediculosis?	141(47)	159(53)	0

T= true, F = false.
a= Lice biology. The reference category is: a^1 statement. b= Survival. The reference category is: b^1 statement.
c= Transmission. The reference category is: c^1 statement. d= Infestation likelihood. The reference category is: d^1 statement.
e= Clinical features. The reference category is: e^1 statement. f = Infectivity. The reference category is: f^1 statement.
g= Treatment. The reference category is: g^1 statement. h^1= Prevention & eradication.

A further analysis was conducted in Table 3, performing multivariate test to obtain the odd ratios of the variables.

Table (3): Estimation of the best predictor factor for assessment of students' knowledge regarding pediculosis (n=300).

Variables	N	Percentage	Sig.	Odd Ratio* (95% Cl)
Lice biology	855	71.3%	0.000	2.478 (2.187-2.808)
Survival	243	40.5%	0.000	0.681 (0.578-0.801)
Transmission	964	64.3%	0.000	1.799 (1.618-1.999)
Infestation likelihood	700	58.3%	0.000	1.400(1.248-1.570)
Clinical features	579	64.3%	0.000	1.804(1.574-2.067)
Infectivity	528	88.0%	0.000	7.333(5.733-9.381)
Treatment	628	52.3%	0.106	1.098(0.980-1.230)
Prevention & eradication	294	98.0%	0.000	49.000(21.836-109.958)

Multinomial regression model of pediculosis students' knowledge. *Odds ratios are in relation to reference categories of each variable as mentioned in Table 2.
Statements regarding biology of head lice. About (71.3%, OR=2.47) answered correctly to the statements: head lice are insects that can't fly or jump from one to another, they are blood sucking and more than one species can infest the humans. This high level of knowledge can be explained as the population sample are biologists; and the term entomology is one of the main terms studied in biology department.
lice survival statements had answered correctly by 40.5%; this indicate weak awareness. Only (35.7, 45.3) % of participants appeared right knowledge to statements regarding lice survival: "the louse dies within 48-72 h, if it falls off a person's head" and "in active pediculosis, it's possible to see some lice on nape of neck or on the collar" respectively.
Regarding lice transmission, there was some shortage in knowledge: infestation due to poor hygiene (39.7%), pediculosis is zoonosis (43.3%). While sharing infested combs, pillows and clothes does not result in transmission has (100%). Previous surveys involving health professionals (physicians, pharmacists & community nurses) have shown insufficient knowledge on pediculosis transmission and control [17,18,19].
Infestation likelihood related phrases showed correct responses in 58.3%. About one third of our participants had correctly answered on "pediculosis spread in developing countries only" because a common wrong thought that few rates of pediculosis in developed countries! In fact, high prevalence values are reported in industrialized countries like USA and almost all countries of Europe [20,21] as well as in developing ones: Pakistan, India, Argentina and Australia [22,23]. All over the world there have been epidemics and elevated prevalence especially among children in primary schools. In some cases, the prevalence may reach to 60 % [20-21].
Clinical features appeared 64.3% with OR= 1.804. Most of participants correctly answered on "scratching of the scalp is frequent symptom of head lice infestation" although there are some pediculosis infested patients are asymptomatic. About three fourth of participants positively answered about ability of differentiation between nits and dandruff, however misinterpretations are frequent.
Infectivity had the highest awareness level (88%, OR=7.33). Normally, infestation consequences are not severe, although experimental evidence showed that head lice can act as vectors of *Bartonella quintana and Rickettsia prowazekii* the causative agents of trench fever and typhus respectively [24,25]. As well as the infestation had a significant role as a risk factor for anemia in school students [26], besides it's relevant social effects.
Concerning treatment, the statistical evidence mentioned that (52.3%, OR=1.098) correctly responded with no significant differences were observed between its items. Some items seem not to be much acknowledged; only (30.3%) of students think that not all the available medications are effective against lice & nits because of the resistance [27,28]. Also, only 12.3% of students were considered "child who has allergies, asthma and other medical conditions should be treated in alternative treatment options as health care provider asks because these patients have reservations about using chemical substances [29].
As known, overuse of neurotoxic pediculicides like malathion, permethrin, and other medications has resulted in resistant populations of head lice [30] as a result of a point mutation in the region of the alpha subunit of the neuronal sodium channels (kdr gene) [31,32]. The efficacy of permethrin fell from 97% to 30% during the 1990s till 2010 [33]. Treatment failure sometimes occurs due to uneven application or the medication applied to hair that is dripping wet [34].
There are several points to prevent pediculosis during infestation: all the bedding and clothing which used by infested child should be washed with hot water and exposed to sunray. in a certain previous study, 8.2% of study population had used pediculicides as a prevention against head lice infestation! more than half did so because the siblings had head lice [15].
As shown by the answers of items 26 & 27, there is a considerable rate of shame and stigmatization felt by the mothers if her child infested with pediculosis because of the idea that the infestation is linked mainly to poor hygiene and low personal care. This shame may be associated with the parents' great reluctance to approach health providers leading them to apply traditional head lice management which frequently are toxic and/or flammable substances. As was reported by the study in Australia, ignorance of right head lice medications is

directly associated with the use of improper and dangerous remedies [35].

Finally, the phrase "do/did you ever join an educational session about pediculosis?" was positively answered by only 47%. That indeed reflects a shortage in public healthcare awareness programs toward a common health problem. Therefore, health education intervention for "all levels" on pediculosis should be provided by making seminars, lectures, posters or informative brochures towards the topic. Head lice educational needs may vary among families of different socioeconomic status and communities [15], even the school and pre-school children could be received simplified lice information programs.

Table 4: Reasons led some of surveyed mothers to check their children for head lice (*n*=50).

Reasons	No.	%
Previous infestation	11	22
Classmate infestation	3	6
Household infestation	8	16
Itching	26	52
Regularly checking	2	4

As in Table (4), of those that checked, the majority of households had tended to investigate if an itching appeared (52%), as 78.3% of our participants believed that scratching of the scalp is frequent symptoms of head lice infestation (Table 2). Whereas classmate infestation approved the least frequent reason for head checking (6%).

It's worth mentioning that the main symptom is itching, caused by sensitization to louse saliva, which starts at about 4 to 6 weeks after the first infestation. But on reinfestation, itching starts after 2 days [1]. Therefore, pediculosis can be asymptomatic, thus undetected cases, especially children, can be carriers and this explains recurrent minor outbreaks [36], leading to a health problem [37]. The longer duration of any directly transmitted parasite, the more spread of it [38], thus checking routines are so effective to control head lice infestations by both regular checking and thoroughness. Checking should be intensified when pediculosis outbreak incidence occurs especially in certain seasonal rhythm [15]. This can only be achieved by good communication and transparency among peers, families and the educational institutes [39,40].

Table 5: Head checking frequencies for head lice by surveyed mothers (*n*=81).

Frequencies	No.	%
Weekly	4	4.9
Bi-monthly	14	17.3
Monthly	27	33.3
Seasonally	5	6.2
Never	31	38.3

Regarding lice-checking frequencies in Table (5), most households checked their members for head lice monthly 33.3%, less were checked bimonthly (17.3%) and rarely weekly 4.9 %. Whereas 38.3% of them did not check at all! only if there were at least one of the reasons mentioned above.

Thorough checking with a lice comb should be applied, as it is more effective than visual inspection with fingers or ordinary comb [41]. Metal nit combs remove up to three times more lice, eggs, and nits from the hair than do plastic ones [42]. The number of children in the family also influenced checking frequency and thoroughly; the more children in the family, the more checked and more thorough than households with one child only [15,43].

Conclusion

The level of information for students regarding pediculosis seems to be rather substandard. The study's recommendation is that need for improvement and to increase accurate information and awareness by local health education programs and strategies.

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REFERENCES

1. Meister, L. & Ochsendorf, F. (2016). Head lice—epidemiology, biology, diagnosis and treatment. Dtsch Arztebl Int; 113: 763–772. DOI: 10.3238/arztebl.0763.
2. Parison, J.; Speare, R.& Canyon, D. (2013). Head lice: the feelings people have. Int J Dermatol. 52(2):169-71.
3. Parison, J.; Canyon, D. (2010). Head lice and the impact of knowledge, attitudes and practices - a social science overview. In: Heukelbach, J., editor. Management and control of head lice infestations. Bremen: UNI-MED Verlag AG: 103–109.
4. Tebruegge, M.; Pantazidou, A. & Curtis, N. (2011). What's bugging you? An update on the treatment of head lice infestation. Arch Dis Child Educ Pract Ed; 96: 2–8.
5. Feldmeier, H. & Heukelbach, J. (2009). Epidermal parasitic skin diseases: a neglected category of poverty-associated plagues. Bull World Health Organ 87: 152-159.
6. Graham-Brown, R.; Bourke, J.& Cunliffe, T. (2010). Dermatology: fundamentals of practice. Terjemahan Nirmala, W.K. Dermatologi Dasar untuk Praktik Klinik. EGC. Jakarta.
7. Suleiman, A. & Magar, E. (2014). Study of Distribution of Head Lice *Pedicalus humanus* Among the Students of Many Primary School in Kirkuk Province *Pediculus humanus capitis* De Geer (Anoplura: Pediculidae). Tikrit journal for Pure Sciences; (6) 19: 1-6.
8. Salih, H.; Shamran, S.& Al-shimerty, D. (2017). Prevalence of *Pediculosis capitis* (head lice) and treating among children in Al- Najaf city, IRAQ. Al-Kufa University Journal for Biology; 9 (3):179-183.
9. Kadir, M.; Taher, H. & Ali, I. (2017). Head lice infestation among local and displaced secondary school girls and its effect on some hematological parameters in Kirkuk city. Kirkuk University Journal. ISSN: 1992-0849 (Print), 2616-6801(Online).
10. Ali, F. & Hama, A. (2018). Prevalence of Head Pediculosis Among Refugees in Sulaimani Governorate/ Kurdistan- Iraq. Iraqi Journal of Science; 59(2C):1012-1018.

11. Canyon, D. & Speare, R. (2007). Do head lice spread in swimming pools? Int J Dermatol 7; 46: 1211–1213.
12. Parison, J.; Speare, R. & Canyon, D. (2008). Uncovering family experiences with head lice: the difficulties of eradication. Open Dermatol J; 2: 9-17.
13. Rukke, B.; Birkemoe, T.; Soleng, A.; Lindstedt, H.& Ottesen, P. (2011). Head lice prevalence among households in Norway: importance of spatial variables and individual and household characteristics. Parasitology, 138(10):1296-1304.
14. Barker, S.C. (1994). Phylogeny & classification, origins, and evolution of host associations of lice. Int J Parasitol; 24: 1285–1291.
15. Rukke, B.; Birkemoe, T.; Soleng, A.; Lindstedt, H. & Ottesen, P. (2012). Head Lice in Norwegian Households: Actions Taken, Costs and Knowledge. PLoS ONE; 7 (2): e32686. doi: 10.1371/journal.pone.0032686.
16. AlBashtawy, M. (2012). Knowledge, attitudes, and practices of parents/guardians regarding pediculosis in the Umm el-Jimal district of Jordan. Journal of Research in Nursing. DOI: 10.1177/1744987112465882
17. Mumcuoglu, K.; Mumcuoglu, M.; Danilevich, M. & Gilead, L. (2010). Knowledge and practices of health professionals regarding head lice. In Heukelbach, J. editor. Management & control of head lice infestations. Bremen: UNI-MED Verlag AG. 111-114.
18. Olowokure, B., Jenkinson, H.; Beaumont, M. & Duggal, H. (2003). The knowledge of healthcare professionals with regard to the treatment and prevention of head lice. Int J Environ Health Res, 13: 11-15.
19. Philips, Z.; Whynes, D.; Parnham, S.; Slack, R. & Earwicker, S. (2001). The role of community pharmacists in prescribing medication for the treatment of head lice. J Public Health Med., 23: 114-120.
20. Hansen, R. C. (2004). Overview: the state of head lice management and control. Am J Manag Care, 10: 260-263.
21. Menan, E. L.; N'Guessan, G. & Kiki-Barro, P.C. (1999). Scalp pediculosis in school environment in the city of Abidjan: prevalence and influence of socioeconomic conditions. Santè, 9:32-37.
22. Kamiabi, F.; Nakhaei, F. H. (2005). Prevalence of *Pediculosis capitis* and determination of risk factors in primary schoolchildren in Kerman. East Mediterr J., 11:988-992.
23. Khokhar, A. A. (2002). Study of *Pediculus capitis* among primary schoolchildren in Delhi. Indian J Med Sci., 56:449-452.
24. Robinson D, Leo N, Prociv P, Barker S (2003) Potential role of *Pediculus humanus capitis*, as vectors of *Rickettsia prowazekii*. Parasitol Res., 90:209–211
25. Sasaki T, Poudel S, Isawa H, Hayashi T, Sekia N, Tomita T, Sawabe K, Kobayashi M (2006) First Molecular Evidence of Bartonella quintana in *Pediculus humanus capitis* (Phthiraptera: Pediculidae), Collected from Nepalese Children. J Med Entomol., 43:110–112
26. Sudayasa, I.; Arimaswati, M Abdullah, A. & Masumi, A. R. (2018). The influence of head lice (*Pediculus humanus capitis*) infestation to nutritional status and anemia occurrence on female elementary school students. IOP Conf. Series: Materials Science and Engineering. doi:10.1088/1757-899X/434/1/012317
27. Heukelbach, J.; Sonnberg, S.; Becher,H.; Melo, I.; Speare, R.& Oliveira, F. (2011). Ovicidal efficacy of high concentration dimeticone: a new era of head lice treatment. J Am Acad Dermatol., 64: e61–2.
28. Kasai, S.; Ishii, N.; Natsuaki, M. (2009). Prevalence of kdr-like mutations associated with pyrethroid resistance in human head louse populations in Japan. J Med Entomol., 46: 77–82.
29. Handbook of Non-Drug Intervention Project Team. (2013). Wet combing for the eradication of head lice. Aust Fam Physician., 42: 129–130.
30. Takano-Lee, M,;Yoon, S.; Edman, D.; Mullens, B. & Clark, J. (2003). *In vivo* and *in vitro* rearing of *Pediculus humanus capitis* (Anoplura: Pediculidae). J Med Entomol., 40: 628–35.
31. Takano-Lee, M.; Edman, D.; Mullens, B. & Clark,J. (2005). Transmission potential of the human head louse, *Pediculus capitis* (Anoplura: Pediculidae). Int J Dermatol., 44: 811–816.
32. Durand, R.; Bouvresse, S.; Berdjane, Z.; Izri, A.; Chosidow, O. & Clark, J. (2012). Insecticide resistance in head lice: clinical, parasitological and genetic aspects. Clin Microbiol Infect., 18: 338–344.
33. Speare, R.; Thomas, G.& Cahill, C. (2002). Head lice aren't found on floors in primary school classrooms. Aust N Z J Public Health, 26: 208–211.
34. Burgess, I. F. (2014). How long do louse eggs take to hatch? A possible answer to an age-old riddle. Med Vet Entomol., 28: 119–124.
35. Counahan, M.; Andrews, R. & Weld, H. (2007). What parents in Australia know and do about head lice? Rural & Remote Health.7(3): 687.
36. Feldmeier, H. (2012). *Pediculosis capitis*: new insights into epidemiology, diagnosis and treatment. Eur J Clin Microbiol Infect Dis., 31: 2105–2110.
37. Heukelbach, J. & Feldmeier, H. (2010). Clinical aspects. In: Heukelbach, J. editor. Managements and control of head lice infestations. Bremen: UNI-MED Verlag AG; pp. 43–45.
38. Begon, M. (2009). Ecological epidemiology. In: Levin, S. A. editor. The Princeton guide to ecology. Princeton: Princeton University Press. pp: 220–226.
39. Nutanson, I.; Steen, C.; Schwartz, R. & Janniger, C. (2008). *Pediculus humanus capitis*: an update. Acta Dermatovenerol Alp Pannonica Adriat. 17(4):147-54.
40. Laguna, M. F. & Risau-Gusman, S. (2011). Of lice and math: using models to understand and control populations of head lice. PLoS One. 6(7): e21848.
41. Jahnke, C.; Bauer, E.; Hengge, U. & Feldmeier, H. (2009). Accuracy of diagnosis of *pediculosus capitis*: visual inspection vs wet combing. Arch Dermatol., 145: 309–313.
42. Speare, R.; Canyon, D.; Cahill, C. & Thomas, G. (2007). Comparative efficacy of two nit combs in removing head lice (*Pediculus humanus* var. *capitis*) and their eggs. Int J Dermatol., 46: 1275–1278.
43. Chosidow, O. (2000). Scabies and pediculosis. Lancet, 355:819- 826.