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HEAD LICE IN PAKISTAN: UNDERSTANDING EPIDEMIOLOGY, SOCIETAL ATTITUDES, TREATMENT PREFERENCES, AND PEDICULICIDE RESISTANCE TRENDS

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Abstract
Pediculosis is human louse infestation, also referred to as headlice infestation in clinics. Headlice [*pediculous humanus capitis*] is a hematophagous ectoparasite sucker lice that lives on human scalp. After transmission, it carries out essential life processes including feeding and reproduction. Feeding causes the development of symptoms among which most common are itching, irritability, sores in the scalp, etc. While complications may include lymphadenopathy and co-infections. The main objective was to establish the emergence of resistance in present pediculicides and the need of newer anti-headlice agents which should be more effective and convenient to use. A survey was conducted via Google questionnaire form, in which data was collected in 5 different sections. Headlice prevalence was highest in 20-30 age group. Prevalence was highest in long straight hair. The majority 64.2% controlled headlice by fine combing. 93.5% population never consulted a physician for headlice eradication, mostly people were using anti-lice shampoo. Interestingly, almost half of these failed to eradicate headlice. Regarding social perception for head lice infestation, majority 40.8% were considerate about people around them who may get lice infestation; but a large number were embarrassed and wanted to eradicate pediculosis at earliest if they got headlice. Regarding the need of newer pediculicides, there were significant evidence according to collected data about inconvenience, safety issues, and development of resistance in preferred conventional therapies. 85.1% respondents were exclusively agreed upon need of newer pediculicides for headlice infestation.

Keywords: Headlice, pediculosis, infections, resistance, treatment for pediculosis

Introduction

Pediculosis:

Pediculosis is a human louse infestation caused by Ectoparasite *Pediculus humanus capitis* known as Head lice. Head lice are the size of about sesame seed, and live and reproduce on human scalp. The most common symptoms in people having Pediculosis are itching, anemia, uneasiness, irritability which may lead to lack of sleep known as insomnia [1].

Transmission and infestation

Head lice or pediculosis, they are caused by hematophagous lice and they may transmit by direct contact with head-to-head, skin to skin, or hair to hair or via object. Head lice live on scalp or sometimes on neck, and attached their eggs to the hair shaft. They travel from once site to another for feeding via crawling.

- Head lice spread through combs, brushes and by sharing clothes.
- Head lice transmission and spread is more common in children.
- Head lice prevalence is more common in places with more crowd and close sitting arrangements such as school, collages, Universities and Public places [2].

Symptoms

Head lice infestations can be asymptomatic, that is, doesn't necessarily present any symptoms, especially during first or early infestation. It takes more than 4 weeks to develop sensitivity for clinical signs of headlice. Hence symptoms of pediculosis may occur after 4 weeks of transmission and new infestation. Itching is the most prominent sign of infestation due to allergic reaction at bite site [3].
Following are some additional symptoms of headlice infestation and its complications:

- An unpleasant sensation which occurs when headlice moves within hair strands.
- Insomnia due to persistent pruritis and scratching
- Head sores may develop and become co-infected with normal flora due to continuous scratching
- Swollen lymph nodes in head region
- Conjunctivitis and other allergic symptoms developed due to foreign antigen being injected by headlice [4].

The ***diagnosis*** for pediculosis can be made by visual inspection of scalp, or fine combing of suspected person. Presence of live lice or nits indicates pediculosis [5-8].

Treatment

Treatment of headlice should be based on multidisciplinary approach, and in consideration with prevention of reinfestation, since reinfestation may result in eradication therapy failure.
It is not necessary to take non-pharmacologic measures along with anti-louse agents to get rid of a head lice invasion. Resistance to these products is recent development but otherwise, pharmacologic agents are effective to completely eradicate pediculosis. The individual's age, infestation seriousness, any prior use of pediculicides, and existence of comorbidities such as sensitivity, seizures, psoriasis, may influence the upcoming anti-lice therapy recommended or self-opted by the affected patient.

Following treatment modes are commonly practiced:

A. Pharmacologic treatment line:

They are neurotoxic agents, work by attacking central nervous system of louse. They may be given as single agent or in combination with other agents.

- **Allopathic:**
  - *Oral pediculicides:* Ivermectin tablets are commonly prescribed in clinics.
  - *Topical pediculicides:* permethrin, malathion as active ingredient in different preparations.
    - ✓ OTCs
    - ✓ Non OTCs
- **Substitutional therapies:**
  - Occlusive/ smothering agents
  - Dehydrates/ desiccants
- **Herbal formulations:** they may vary widely upon individual's usage.

B. Non-pharmacologic treatment line:

It focuses on manually removing headlice mostly via fine comb in wet or dry hair. However multiple studies suggest allopathic agents to be most potent, effective and convenient in terms of complete eradication of headlice.

- **Manual/ physical methods: fine combing**

Table 1.1: Topical Over-the-counter [OTC]. Treatments		
AGENTS [ANTI LOUSE].	**NOTES**	**MODE OF ACTION**
IVERMECTINE 0.5% LOTION Brand name: [Sklice].	Not ovicidal, but prevent nymphs. Pediculicidal in sufferer ≥ 6 months. Upton 70% of patients become lice-free 2 weeks after one treatment, no need for nit brushing. **Side Effects:** Skin burning sensation, conjunctivitis, Xerosis , dry scalp.	Act as a post-hatch insecticide by lessen blood feeding of head lice. Thus binds selectively to glutamate-gated Cl- channels in louse muscles and neurons leads to hyperpolarization, thus lice are not viable because of it's pharyngeal muscle numbness.
PERMETHRIN 1 LOTION Brand names: Nix, Elimite, and Acticin	"Drug of choice "for head louse. Control newly hatched lice for some days later therapy. A second therapy often is required. Suitable for ≥ 2 months. **Side effects:** localized inflammation, numbness or tingling of the Skin.	Affect nerve cell membranes and interfere with signal transmission between the brain and muscles of lice and become inactive or breathless.
PYRETHRINES WITH PIERRONYL BUTOXIDE [SHAMPOO]. Brand name: R&C	It takes 24 hours for the lice to die after therapy. A second implementation may be required week later. Used for ≥ 24 months. **Side Effects**: Scalp irritation, such as itching, puffiness, or redness	Hinder Na+ channel, neurotoxic and accelerate paralysis or death of lice.
Table 1.2: Topical Neurotoxic Prescription Treatment [Rx].		
AGENTS [ANTI LOUSE].	**NOTES**	**MODE OF ACTION**
BENZYL ALCOHOL LOTION Brand name: Ulesfia , Zilactin	Treat for ≥ 6 months Another implementation is required 7 days following the initial therapy. **Side Effects:** itching, redness, numbness or pain	Obstruct the respiratory spiracles, prevent respiration result in lice asphyxiation.

Emergence of pediculicides resistance

MALATHION LOTION 0.5% Brand name product: Ovide	Partially ovicidal. Re–treatment is advised if lice still are alive 7–9 days after Therapy. For ≥ 6 years. **Side Effects:** Scalp dryness, local irritation or skin burn, conjunctivitis.	This parasympathomimetic antiparasitic inhibits cholinesterase that degrades acetylcholine resulting in lice's death since their nervous system rendered inoperable.
SPINOSAD 0.9% TOPICAL SUSPENSION Brand name product: Natroba	Ovicidal, retreatment is advised if lice are still alive and nit brushing often unnecessary. Treat ≥ 6 months. **Side Effects** Redness on scalp ,Irritation at the applied site, Eye redness, Dry skin, alopecia.	Boosting nicotinic acetylcholine effect, via altering its receptors Consequently, paralysis the parasite induces neuronic hyper excitation. Spinosad seems to be potent new ally in fight against louses [9-12].

Pediculosis is a global disease, and random usage of pediculicides for headlice eradication without following proper guidelines is leading to emergence of resistance, and then transmittance of those resistant headlouse to another person.

Treatment failure also increases the risk of development of resistance, which may lead to complex pediculosis where patient needs additional therapy to eradicate headlice.

Factors contributing to pediculicide resistance

detecting insecticide resistance is a complex and time consuming process. resistance to anti headlice agents have many causes which include:

- ❖ Incorrect dosing, misuse and incorrect treatment.
- ❖ Refusal of patients to treatment protocol.
- ❖ Lack of ovicidal of product [13-15].

Poor self-hygiene and its association with higher headlice infestation

Headlice transmission can happen through any carrier, object or person, hence it is caused by transmission of headlice, and not caused by poor self-hygiene. But self-hygiene is must be maintained to control and eradicate headlice. Poor self-hygiene has been associated with higher infestation of headlice, which is then difficult to control and may lead to therapy failure, and more susceptibility to transmit it to other person [16-17].

Material And Method

- **Study design:** It is a survey-based study.
- **Settings:** The survey was conducted from all areas of Pakistan.
- **Study Duration:** 1 month
- **Population size:** 201 responses
- **Inclusion criteria:** People of all ages, Pakistani national.
- **Exclusion criteria:** non-Pakistani nationals.
- **Data collection Technique:** Data was collected using Google questionnaire form by circulating on social media in general public and with physicians.
- Questionnaire is designed to have an introductory section, and 5 sections which will collect data according to objective as follows:

Table 2: Methodology defining sections of questionnaire

Introductory section	Defines objective, and contains a note to physicians whom the questionnaire will be shared
Section 2	Demographics
Section 3	Each individual's preferred headlice eradication regime
Section 4	Opened for those individuals only, who consulted physician for headlice eradication
Section 5	How an individual views pediculosis affected person
Section 6	Perception of individual for need of modified or newer pediculicides

Data Analysis: Data for each section will be analyzed separately via calculating percentage.

Result

Table 3.1: Demographics Features of the participants			
Gender	Male	35	17.4%
	Female	166	82.6%
Age	<10	6	3%
	10-19	23	11.4%
	20-30	153	76.1
	>30	19	9.5
Province	Sindh	154	76.6
	Punjab	31	15.4%
	Balochistan	2	1%
	KPK	8	4%
	Other areas	6	3%
Hair type	Curly	66	32.8%
	Straight	98	48.8%
	Long	90	44.8%
	Short	72	35.8%

Table 3.2: Knowledge regarding Head lice Eradication Regime			
Respondents ever got head lice infestation	Yes	167	83.1%
	No	34	16.9%
Preferred treatment options	Oral tablets	8	4%
	Anti-lice allopathic shampoo	72	35.8%
	Anti-lice head cream	16	8%
	Combing	131	65.2%
	Home remedies/ herbal treatment	47	23.4%
	Never got head lice	37	18.4%
	Others: hair washing	1	0.5%
Consulted physician for head lice treatment	Yes	13	6.5%
	No	186	93.5%

Table 3.3: Attitude of participants for proper treatment of infestation			
Treatment therapy suggested by Dr.			
	Oral tablets	3	20%
	Anti-lice allopathic shampoo	12	80%
	Anti-lice head cream	5	33.3%

	Combing	7	46.7%
	Home remedies/herbal treatment	1	6.7%
	None	1	6.7%
Dr. counselled patient about reinfestation and spread.	Yes	10	66.7%
	No	5	33.3%
Successful Therapy recommended by physician	Yes	8	53.3%
	Recommended therapy failed	7	46.7%

Table 3.4: Perspective of participants after attainting the infestation			
Having knowledge that headlice is a disease?	Yes	94	47%
	no	106	53%
Reaction when got head lice	I should hide it	17	8.5%
	End it at earliest	103	51.2%
	I should hide and end at earliest	56	27.9%
	Never got headlice	25	12.4%
Response when they see someone who is around them having headlice	Maintain distance with them	71	35.3%
	They don't maintain personal hygiene	48	23.9%
	Its ok, can happen to anyone	82	40.8%

Opinions of participants regarding the use of non-pharmacological treatment method			
Opinion about anti-lice shampoo	Good for ending head lice	109	54.2%
	Good in past but not now	48	23.9%
	Doesn't kill nits	78	38.8%
	Painful on my scalp	16	8%
Opinion about fine combing	Good for removing lice and nits	145	72.1%
	Not suitable for my hair	26	12.9%
	Time consuming	82	40.8%
	Painful	62	30.8%
Ever used oral anti-lice tablets	Yes	13	6.5%
	No	186	92.5%
	Its ineffective and resistant	2	1%
Opinion about need of more effective, quick and safe anti-lice medications	Yes	171	85.1%
	No	28	13.9%
	Maybe	2	1%

Usually, females participated in this research. Head lice prevalence was highest in 20-30 age group. Prevalence was highest in long straight hair. Majority [64.2%] controlled headlice by fine combing. 93.5% population never consulted physician for headlice eradication, among which most were recommended anti lice shampoo. Interestingly, almost half of these failed to eradicate headlice.
About social perception for headlice infestation, majority [40.8%] were considerate about people around them who may get lice infestation; but a large majority was embarrassed and wanted to eradicate pediculosis at earliest if they themselves got headlice.

About need of newer pediculicides, there was significant evidences according to collected data about inconvenience, safety issues, and development of resistance in preferred conventional therapies. 85.1% respondents were exclusively agreed upon need of newer pediculicides for headlice infestation.

Discussion

The infestation of head, Pediculosis is the disease caused by ectoparasite which is known as head lice. Species responsible in causing disease is *Pediculus humanus capitis*. They are present on head and scalp or hair. The most common symptom is itching and irritation on scalp, patients who have suffer with pediculosis disease may endure symptoms of insomnia due to uneasiness or irritation. Louse usually feed on human blood, that leads to severe condition of anemia, although this is a very rare condition but there are many cases reported over it. Headlice is contagious disease also known as communicable disease and have wide prospect of spreading from person to person, although this is not only the reason to have headlice. As it is a parasitic disease anyone can have it regardless of maintaining hygiene condition. Head lice infestation can be asymptomatic as sometimes it may take 4-6 weeks for symptom to appear, when a person is having head lice for the first time it might be due to some allergic reactions.

There can be many treatment options for pediculosis which includes pharmacological and non-pharmacological therapy regimens. According to studies, there are many topical over the counter treatment for the patients who are suffering from headlice disease. In pharmacological treatment oral tablets are inclusive to eradicate pediculosis. Along with this, different topical products are dispensed by pharmacies to clear out headlice infestation. In non-pharmacological treatments, combs are commonly used to manually remove lice and nits from hair.

The data was collected via google form questionnaire in different sections containing questions about different aspects of headlice infestation. The data will be discussed under following categories:

Epidemiology

First section of survey defines demographics, according to which 82.6% female responded the survey question where as 17.4% were male. Majority of respondents were in 20-30 age group, with majority of them from Sindh and then from Punjab.

Type of hair is one of the important parameters in collecting data on headlice, which may indicate type of hair more susceptible for infestation of headlice. It is found that greater number of respondents are with straight long hairs then the one with curly short hair.

Preferred head lice eradication regime

Among 201 participants, 83.1% had experienced headlice infestation once or more in life; out of which 64.2% controlled headlice by fine combing, 34.8% used anti-lice allopathic shampoo, 22.9% by using home remedies, 4% with oral tablet, and few eradicated it by daily washing.

Consulting physician for treatment

Out of all respondents, 93.5% have not visited physician for the treatment of pediculosis, while 6.5% [15 out of 201] respondents took the condition to physician.

The most recommended therapy in physician's office was anti-lice allopathic shampoo, 12 [80% respondents who consulted physician].. While only 3 [20%]. were prescribed oral pediculicides. 46.7% [7] respondents were recommended fine combing, while 33.3% [5] were recommended topical anti lice creams.

According to data collected, it was found that 66.7% respondents who took their disease to physician were guided about prevention of reinfestation and spread while remaining others [33.3%] were not guided. And hence only 8 respondents [53.3%] who followed physician's prescription were able to successfully eradicate headlice while other 7 respondents [46.7%] ended up in therapy failure. This

failure can be interpreted according to following possible reasons: lack of proper guidelines for pediculosis treatment, inefficiency of present pediculicide agents, and inadequate patient counselling.

Social image of pediculosis infected person

Pediculosis is an insufficiently discussed topic. Mostly people are not aware about pediculosis as a disease. WHO categorizes it as a disease, CDC has given guidelines for its treatment. It is important to acknowledge and spread awareness, that pediculosis is a disease caused by head lice infestation and definitely not caused by poor self-hygiene; and it can lead to discomfort, co infections and self-esteem issues due to society's dislikeness for such patients [2,16,17-19].

This section of the survey collected data about the perception of people regarding headlice. According to data gathered, there are lesser people [53%] who have knowledge that headlice infestation is a disease, hence people don't view headlice infested population as someone diseased. This can be blamed on lack of education and awareness about this condition. In this era, social media is the biggest platform for spreading health awareness but this condition is not given that light as it deserves nor discussed as a serious issue; or it could be because people don’t consider it to be a serious health issues [19].

According to multiple studies conducted in under developed countries including Iran, Nigeria and Pakistan, people associate pediculosis with poor hygiene and unclean living condition leading to a mass public perception that headlice infestation only affects certain groups of people; when in fact this is a misconception, as head lice can affect anyone regardless of their hygiene and living conditions just like any other parasitic diseases. it is important to educate people about this fact and raise awareness about the condition so that it can be properly treated and prevented [2,16-17].

we also designed some questions to collected data on, what part each individual is playing in society, in building ill mindset and dislikeness for lice infested people.

As per data, 40.8% people were considerate that it may happen to anyone, when seeing headlouse infected people around them. 35.3% wanted to maintain distance with affected person, while 23.9% believed that it was all about not maintaining proper personal hygiene.

We determined the reaction of respondents on having headlice infestation in their own scalp, it was observed that people were not enough confident to talk about this disease. it's unfortunate that some people may have negative attitude towards individual with pediculosis.

According to data we collected, 51.2% want to eradicate headlice as soon as possible. Possible reasons can be the fear of public reaction and trouble of symptoms, effect of hair growth, and inconvenience caused by headlice. 27.9% wanted to hide pediculosis, while 8.5% were agreed on both.

This trend observed in data can be justified by fear and embarrassment of being exposed in public, society's dislikeness and in-acceptability for pediculosis affected patients that it is caused by poor self-hygiene, people tend to be hideous about their own disease[pediculosis]. and may want to eradicate it as soon as possible.

Need of newer pediculicides

Need of new pharmacologic agents can be established when there are evidences of safety issues, ineffectiveness, resistance in present agents, or if the present therapy in practice have issues with patient convenience and compliance.

12.9% of population stated that fine combing is not suitable for their hair. 30.8% find fine combing painful to do, while 40.8% people find it time consuming.

The results indicate the ineffectiveness and inconvenience associated with fine combing which is most opted therapy for headlice eradication: 72.1% prefer it as therapy of choice for of headlice eradication, Whereas, 92.5% population did not opt for oral anti-lice tablets, which is infact an easier option. This can also be inferred as this happened due to lack of awareness. 16% of the people complained about irritation with use of anti-lice shampoos, which infers possible safety related issues in anti-lice topical agents.

Important part of this study was to look for evidences of resistance in present pediculosis regime in pediculosis patients irrespective of their consultation status with physician. The evidence of resistance obtained according to data were that 48.9% people found anti lice shampoos not as effective as it was in past, while some people also mentioned that it doesn't kill nits.
Last part of survey was direct question to know the opinion and recommendation of general public about the need of newer anti lice agents. Individual perception for the need of newer or modified drugs matter a lot in terms of future research and drug development. According to responses, 85.1% of respondents were agreed upon the need of newer safe, efficient, and convenient to use action anti-lice medication.

Conclusion

This research has opened new doors to further researches and development on newer anti-headlice agents. Pediculosis needs to be discussed more as any other ectoparasitic disease. Once pediculosis is diagnosed, steps are taken for treatment due to its inconvenient symptoms such as itching, risk of co infections and social embarrassment. Oral systemic therapy by Ivermectin and Bactrim have proven to be effective in treating head lice. Substitution therapy, via the use of topical occlusive and smothering agents or dehydration and desiccation, is also used for lice extermination and removal. Proper education about eradication and reinfestation should also be considered for CME and general public awareness programs. Close contact and sharing of personal items with carriers should be discouraged to prevent infestation.

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