

Comparative Study of Efficacy of Using Mayonnaise and Hair Shampoo in the Control of Head Lice among Elementary School Students

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Abstract Background and objective: Head lice are expensive and difficult to eradicate, causing much frustration for families, providers, and communities. In order to develop procedures for the care of affected school students with head lice, the researchers (a) assessed the prevalence of head lice infestation rate in primary school students, and the mothers' and teachers' knowledge of head lice infestation and its control measures, and (b) compared the effect of using mayonnaise and hair Shampoo to control head lice among elementary school students. **Materials and Methods:** An experimental design was used to conduct the study. Ten primary schools in Al Riyadh were identified using the cross-sectional study during 2015 and 2016. Five hundred (500) students, chosen through a multi-stage systematic random sample, participated and were randomly divided into two groups. Mayonnaise and hair Shampoo was applied to the first and second group respectively as a treatment for head lice. For all statistical analyses, SPSS version 20 were used. **Results:** using Mayonnaise helped in dismissing head lice was faster among all age groups of girls, none of the girls stayed infected beyond 8 and more days. The Total (82.0%) of girls recovered from infection between 6 to 8 days as compared to only (15.2%) as total among the hair Shampoo group with the same age group. **Conclusion:** The study shed light on the effectiveness of mayonnaise in the obliteration of head lice. Additional studies should be carried out to ensure the success of mayonnaise in overcoming the lice problem.

Keywords: comparative study, efficacy, mayonnaise, hair shampoo, control, head lice, elementary school students

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1. Introduction

Head lice infections are a disturbing and growing problem among elementary school students in Kingdom of Saudi Arabia. In addition to the immigration of huge population as well as the growing current refugee flows and associated poor hygienic conditions. These infections are associated with a significantly reduced quality of life and frequent medical consultations. Consequently, modification of school environment is challenging. Instructing mothers is the key and nit removal is key. Without this a child will never get rid of lice. It is important for school nurses to help the students stay healthy and have the ability to concentrate in the scholastic setting.

Head lice is a surprisingly common human parasitic infestation, with millions of infestations happening each year. Despite the prevalent myth that this condition is associated with poverty (dirty hair), all socioeconomic classes are affected, and head lice actually prefer "healthy

hosts" with clean hair [1,2,3,4]. School students are prone to head lice infection because of their habit of playing in close contact with one another, sharing hats, combs and brushes, and clothing. Each year, head lice affects millions of students in primary school, especially girls, in both the developed and underdeveloped countries, as recorded in numerous studies carried out in different parts of the world According to the results of a study [5]. Head lice prevalence was estimated at 4.8% (The Netherlands), 35% (Brazil), 1.2% (Turkey), 28.8% (Venezuela), and 29.7% (Argentina). About 6-12 million students between the ages of 3 and 11 are treated annually for head lice in the United States alone [6]. High levels of louse infestations have also been reported from all over the world including Israel, Denmark, Sweden, U.K., France, and Australia [7].

Studies indicate different prevalence rates of head lice among primary school students in the world. In Egypt, [8] mentioned that the infestation rate was (16.7%) among primary school students. Moreover, in a comparison between urban and rural areas in Turkey [9] mentioned that the rate of infection was (9.7and 20%) respectively, and 26.6% in Jordan [10]. A study in Chile indicated that

the prevalence was 40.3% [11]. In Pakistan, pediculosis was positive in 272 (20.60%) boys, and 708 (53.64%) girls, with higher prevalence in girls [12]. Head lice are also widespread among school students in Saudi Arabia. In Jeddah, Saudi Arabia, a survey of 2928 primary school girls, revealed that (7.9%) of the girls were infested with head lice [13]. In Al Baha, Saudi Arabia, it was recently [14] reported that the prevalence was (12.2%) 72/590 among primary school girls in Riyadh, Saudi Arabia. [15] found that the prevalence ratio was (17.8%) 800/14300 for eight schools in Riyadh, Saudi Arabia. Therefore, parents in Saudi Arabia should be educated on this subject. The use of accurate findings associated with lice infestation is necessary to avoid misdiagnosis; for example, contact dermatitis, eczema, psoriasis, insect bites, or fungus. It is important to promote the involvement of the healthcare professional to correctly make the diagnosis so appropriate treatment can be initiated [2] and [4].

A primary consequence of head lice infestation is social, as it affects relationships or attendance at school. It is accurate to say that the greatest "morbidity" associated with lice infestation is missed school days. Furthermore, students may be scorned by classmates because of the stigma attached to lice infestation. This may isolate students suffering from head lice and lead to psychological distress as well as disrupt their learning performance [1] and [10]. In light of this, the AAP have recommended the abandonment of "no-nit" policies that preclude student attendance if nits are present in the hair. Health care professionals should work with local schools to eliminate these inappropriate "no nit" policies [16,17,18].

Evidence of the efficacies of different treatment strategies is needed. Generally, high rates of resistance to over-the-counter medications limit their usefulness. Treatment options include topical pediculicides, systemic treatments, physical means, and natural remedies as mayonnaise. [19] The application of mayonnaise can kill head lice faster, and at the same time, it is not costly, simply using and secure [20]. on the other hand, using mayonnaise let mothers more optimism and confidence that they can overcome head lice problem without using insecticides. [21] has received conflicting reports as to its exact effectiveness, but they respecting the parents' opinion to selecting a secure product. [22] both identified that households such as vinegar and mayonnaise have not been known enough to demonstrate their usefulness. Conversely, William Sears, a doctor who has printed more than 40 child-care books, states that mayonnaise is an inoffensive treatment that can get rid of lice, but he not sure that it can be get ride the lice out. In contrast, hair Shampoo (Permethrin1%) is an artificial product that approved by the FDA to kills live head lice but not untied eggs. Permethrin is approved for use on children aged 2 months and older [23].

The study aimed to: Assess the prevalence of head lice infestation rate and some environmental risk factors in primary school students, b. Assess the teachers and mothers knowledge related to head lice infestation and its control measures, c. Compare the effect of using mayonnaise and hair Shampoo in the control of head lice among elementary school students and develop procedures for the care of affected students with head lice and d.

Distribute educational material to school staff and mothers on head lice prevention and care.

2. Material and Methods

2.1. Study Setup

Cross sectional study was conducted at the 10 Elementary schools, in Al Riyadh city Kingdom of Saudia Arabia during the period from 2015 and 2016. The study included 500 girls students of all grades from first to sixth level (1-6) based on a multi-stage systematic random sample. Researchers selected the even numbers, the students was divided into 2 groups, 250 students in the first group and 250 students to second group and was appointed by **the following characteristics**: student be a healthy Saudi girls. Student be a regular at school and suffer from head lice and do not suffer from the health or psychological problems, so the researchers can follow-up the cases.

2.2. Tools

Three tools were used by the researchers to collect data: - structured interview schedule; Hair swab bacteriological examination and follow-up the schedule for signs of hair infection. The content of tools was determined through an extensive review of literature and researches about the hair care.

a-Structured interview Schedule.

This tool included two parts: The first part was include data related to the student age, school level, educational level, part will family size, and parent education, home condition plus information on hair washing (each week). Second part will included data related to the lice, methods of infections, prevention, and treatment used before.

b- Hair swabs bacteriological examination tool.

Swab did (immediately after treatment by 10 days). Suspect head lice and nit examined under a microscope to determine if they're living. This method was a great help, by the way, the researchers can pull out a suspicious item, tape it to white paper and have a look with the microscope to make an accurate diagnosis, consequently be sure from clear hair from lice.

c. Follow-up Schedule for signs of hair infection tool.

This schedule developed by the researchers and filled by them. This tool included two parts: - the first was the checklist to follow up the compliance of mothers of hair care and the second one, to check the presence or not of signs of hair infection (itching, redness, swelling, crust or tenderness) until hair will be free from infection.

2.3. Methods

The researchers divided 500 students randomly, according to the random assignment into two groups. Group (1) who received hair care with mayonnaise, and group (2) who received hair care with lice hair Shampoo.

The researchers determined certain days of the week to collect data from both groups.

Hair Shampoo contains recommended by professionals.

* Formula for 100 gm: 0.6% of N-(hydroxymethyl) -1-cyclohexane 1,2-dicarboximide 2-2- dimethyl-3- (2-methylpropenyl) cyclopropane carboxylate = Tetramethrin. 2.4% of 3.4 methylene dioxy-6-propyl-benzyl-2-butyl diethylene glycol ether = Piperonyl Butoxide. Precautions: For external use only.

Goody Mayonnaise Ingredients: 3 large egg yolk, 4 teaspoons fresh lemon juice, 6 teaspoon white wine vinegar. 1/2 a pinch of salt and 3/4 cup olive oil

For the study groups, the researchers examined each student for the presence of head lice by visual examination of the head, neck and behind ears were investigated for head lice or its effect manifestation, insufficient daylight with the aid of a magnifying hand lens. Students suspected of having head lice were subjected to comb with a fine-toothed comb for about 5 to 10 minutes over a white paper of by combing of the hair with fine-toothed comb on white paper size A3. The students would be considered as positive for head lice infestation, when the researcher detected head lice or nymphs, and live or dead eggs on the paper. (In addition to using a structured questionnaire for collecting data on the students, demographic features such as age, school level, educational level, family size, and parent education, home condition plus information on hair washing (each week). Evidence about the way of hair care presented to the schools teachers and students via a 60 minutes lecture using power point presentation at the beginning of the study for the ten schools settings to gain their understanding and cooperation. At the end of the interview, students/ mothers/ teachers guidance booklet was given: It was designed by the researchers to supply them with essential information about head lice biology and control measures.

The researchers asked the school principle to invite the infected student mothers to meet the researchers. Through the interview, the researchers determined their perception about the problem and gave them ideas about hair care best practice at home. Each mother interviewed for 10 minutes. After explanation for the mother's agreement to participate in the study was taken. For group 1, the researchers explained to the mothers the new method of application of mayonnaise on their daughter's hair at afternoon for 6 hours, cover the head and combing it with fine-toothed comb. Also the explanation for the mothers in group 2 about hair care with hair Shampoo for 6 hours and comb it with the fine-toothed comb.

2.4. Tools Validity

Tools were submitted to a panel of five experts in the field of pediatric medicine, nursing, and biology to test the content validity. Modification will be carried out according to the panel judgment on the clarity of sentences and appropriateness of the content.

2.5. Administrative Design and Ethical Consideration

Ethical Committee of Deanship of research and post graduate studies (IBR) at Princess Nourah bint

Abdulrahman agreed to conduct the study with an approved signed application. An official permission was granted from Ministry of education, and Health unit A stamped letter was given to the director of the schools to get their cooperation. The researchers will introduce themselves to mothers who had students with head lice infection and informed them about the purpose of this research to get their acceptance. The researchers guaranteed them, that no risk to their daughters. All mothers were informed that participation in the research is voluntary and she can withdraw from this study anytime. A written informed consent obtained from mothers who were willing to participate in the research.

2.6. Pilot Research

A pilot research was carried out on 10% of the total sample to check the clarity of items and determine the feasibility of the research. All students participated in the pilot research excluded from the research sample.

2.7. Data Analysis:

Data analysis was conceded using the Statistical Package for Social Sciences [SPSS™] version 20.0 [IBM, Armonk, NY, USA] and presented in percentage base distribution. Data with value of less than 0.05 (CI-95%) was regarded as significant.

3. Results

3.1. Socio-demographic Data of the Study Sample

Table 1 presented that the prevalence of head lice was common among both groups of students especially in grade Level 1st&2nd who aged ranged from 6 to 8 years where more than two third (6.4%) (63.2%) respectively were infected. Families having more than 5 children were (48.0%) and (52.0%) respectively. Although, majority (78.4%) and (75.2%) of mothers were educated but more than two third (62.4%)(60.2%) of mothers were house wives.

Table 1. Socio-demographic data Distribution of Two Groups of Students (n=500 (students))

| Age group (in years) | Group1 N=250 Mayonnaise | Group2 N=250 Hair Shampoo |
|---|----------------------------|------------------------------|
| 6-8 Grade Level 1 st &2 nd | 166 (66.4) | 158 (63.2) |
| 8-10 Grade Level 3 rd &4 th | 60 (24.0) | 74 (29.6) |
| ≥12 Grade Level 5 th &6 th | 24 (9.6) | 18 (7.2) |
| Mean X ± SD | 31.3±7.86 | 1.25±7.88 |
| Family Size | | |
| 1-2 | 62 (24.8) | 70 (28.0) |
| 2-4 | 68 (27.2) | 50 (20.0) |
| ≥5 | 120 (48.0) | 130 (52.0) |
| Mother Education | | |
| Educated | 196 (78.4) | 188 (75.2) |
| Uneducated | 54 (21.6) | 62 (24.8) |
| Mother Job | | |
| Employed | 94 (37.6) | 98 (39.2) |
| Un employed | 156 (62.4) | 152 (60.8) |

Table 2. Relationship Between Students Age, Hair Examination Results, Recurrence, and Number of People Shared Room

| Age group (in years) | Group1 N=250 Mayonnaise | | | | | | Group2 N=250 Hair Shampoo | | | | | |
|----------------------------------|----------------------------|---------|-----------------------|---------|---------------------|--------|------------------------------|--------|-----------------------|--------|---------------------|--------|
| | 6-8 years (n=166) | | 8-10 years (n= 60) | | ≥12 years (n=24) | | 6-8 years (n=158) | | 8-10 years (n= 74) | | ≥12 years (n=18) | |
| | No | (%) | No | (%) | No | (%) | No | (%) | No | (%) | No | (%) |
| <i>Hair length</i> | | | | | | | | | | | | |
| <i>Short < 5 cm</i> | 37 | (22.3) | 10 | (16.7) | 0 | (00.0) | 42 | (26.6) | 12 | (16.2) | 1 | (5.6) |
| <i>Medium (5cm-15 cm)</i> | 46 | (27.7) | 8 | (13.3) | 5 | (20.8) | 38 | (24.1) | 13 | (17.6) | 2 | (11.1) |
| <i>Long > 20 cm</i> | 83 | (50.0) | 42 | (70.0) | 19 | (79.2) | 78 | (49.3) | 49 | (66.2) | 15 | (83.3) |
| <i>No of repeated infection</i> | | | | | | | | | | | | |
| <i>First Time</i> | 20 | (12.0) | 0 | (00.0) | 0 | (00.0) | 22 | (14.0) | 0 | (00.0) | 0 | (00.0) |
| <i>2-3</i> | 33 | (19.9) | 23 | (38.3) | 3 | (12.5) | 38 | (24.0) | 18 | (24.3) | 4 | (22.2) |
| <i>More than 3</i> | 113 | (68.1) | 37 | (61.7) | 21 | (87.5) | 98 | (62.0) | 56 | (75.7) | 14 | (77.8) |
| <i>Frequency of hair washing</i> | | | | | | | | | | | | |
| <i>Once/week</i> | 30 | (18.1) | 12 | (20.0) | 3 | (12.5) | 28 | (17.7) | 7 | (9.5) | 2 | (11.1) |
| <i>Twice /week</i> | 106 | (63.9) | 24 | (40.0) | 3 | (12.5) | 112 | (70.9) | 33 | (44.6) | 2 | (11.1) |
| <i>Three or more /week</i> | 30 | (18.0) | 24 | (40.0) | 18 | (75.0) | 18 | (11.4) | 34 | (45.9) | 14 | (77.8) |
| <i>No of people shared room</i> | | | | | | | | | | | | |
| <i>1-2</i> | 64 | (38.6) | 22 | (36.7) | 5 | (20.8) | 52 | (32.9) | 23 | (31.1) | 3 | (16.7) |
| <i>2-4</i> | 102 | (61.4) | 38 | (63.3) | 19 | (79.2) | 106 | (67.1) | 51 | (68.9) | 15 | (83.3) |

Table 3. Relationship Between Students Age, Risk Factors and Treatment Used Before Intervention

| Age group (in years) | Group1 N=250 Mayonnaise | | | | | | Group2 N=250 Hair Shampoo | | | | | |
|------------------------------------|----------------------------|---------|-----------------------|---------|---------------------|---------|------------------------------|--------|-----------------------|---------|---------------------|---------|
| | 6-8 years (n=166) | | 8-10 years (n= 60) | | ≥12 years (n=24) | | 6-8 years (n=158) | | 8-10 years (n= 74) | | ≥12 years (n=18) | |
| | No | (%) | No | (%) | No | (%) | No | (%) | No | (%) | No | (%) |
| <i>Risk Factors</i> | | | | | | | | | | | | |
| <i>Sharing hair combs or brush</i> | 120 | (72.3) | 33 | (55.0) | 12 | (50.0) | 138 | (87.3) | 27 | (36.5) | 7 | (38.8) |
| <i>Sharing beds</i> | 130 | (78.3) | 45 | (75.0) | 18 | (75.0) | 143 | (90.5) | 65 | (87.8) | 8 | (44.4) |
| <i>Using towels with others</i> | 118 | (71.1) | 28 | (46.7) | 5 | (20.8) | 102 | (64.6) | 33 | (44.6) | 9 | (50.0) |
| <i>Sharing head covers</i> | 124 | (74.7) | 35 | (58.3) | 0 | (00.0) | 122 | (77.2) | 28 | (37.8) | 0 | (0.00) |
| <i>Treatment Used before</i> | | | | | | | | | | | | |
| <i>Licid Lotion</i> | 134 | (80.7) | 56 | (93.3) | 22 | (91.7) | 138 | (87.3) | 66 | (89.2) | 18 | (100.0) |
| <i>Kerosene</i> | 0 | (00.0) | 0 | (00.0) | 0 | (00.0) | 0 | (00.0) | 0 | (00.0) | 0 | (00.0) |
| <i>Petroleum jelly</i> | 56 | (33.7) | 23 | (38.3) | 12 | (50.0) | 62 | (39.2) | 38 | (51.4) | 10 | (55.6) |
| <i>Vinegar</i> | 133 | (80.1) | 56 | (93.3) | 18 | (75.0) | 128 | (81.0) | 62 | (83.8) | 15 | (83.3) |
| <i>Hair cutting</i> | 44 | (26.5) | 32 | (53.3) | 11 | (45.8) | 40 | (25.3) | 40 | (54.1) | 11 | (61.1) |
| <i>Hand piking</i> | 12 | (7.2) | 3 | (5.0) | 4 | (16.7) | 10 | (6.3) | 5 | (6.8) | 6 | (33.3) |
| <i>Olive Oil</i> | 144 | (86.7) | 48 | (80.0) | 22 | (91.7) | 150 | (94.9) | 70 | (94.6) | 16 | (88.9) |

**Number are not exclusive for risk factors and treatment used.

Table 4. Percentage Distribution of Teachers Responses about Head Lice Pre /Post intervention (N=100)

| Statements | Responses Pre Intervention | | Responses Post Intervention | |
|---|----------------------------|------------|-----------------------------|------------|
| | Agree % | Disagree % | Agree % | Disagree % |
| Are the students consider dirty if they have lice? | 90% | 10% | 0.00% | 100.00% |
| Can they get them from pets? | 40% | 60% | 0.00% | 100.00% |
| Does an infected student withdraw from school? | 70% | 30% | 0.00% | 100.00% |
| Do you instruct mothers the treatment of head lice ? | 40% | 60% | 100% | 0.00% |
| Will not the students be allowed to re-enter until they are lice free? | 100% | 0.00% | 70% | 30% |
| Does the students with nits and no evidence of live head lice will not be excluded from school? | 60% | 40% | 80% | 20% |
| Are school will be conducting a wide surveillance for nits? | 30% | 70% | 100% | 0.00% |
| Does head lice crawl from head to head in close contact ? | 60 % | 40% | 100% | 0.00% |
| Do head lice transmit diseases? | 80% | 20% | 100% | 0.00% |
| Are head lice can survive several days on clothes or furniture ? | 20% | 80% | 100% | 0.00% |
| Do you believe that Lice affect sleeping? | 30% | 70% | 100% | 0.00% |
| Have school nurse is important? | 50% | 50% | 100% | 0.00% |
| Is the school a source of infestation? | 60% | 40% | 100% | 0.00% |
| Is head lice the responsibility only of mothers? | 70% | 30% | 10% | 90% |
| Can itching indicate infestation? | 20% | 80% | 90% | 10% |
| Have instructing about lice diminished infestation? | 40% | 60% | 100% | 0.00% |
| Can mothers use available pediculicides to kill all lice eggs ? | 50% | 50% | 00% | 100.0% |

The Comparison between The efficacy of Mayonnaise Versus Hair Shampoo

Table 5. Relation Between Children Aged group and Treatment Used

| Age group (in years) | Mayonnaise Group N= 250 | | | Total | Hair Shampoo Group N= 250 | | | Total |
|----------------------|----------------------------|------------------------|----------------------|------------|------------------------------|----------------------|----------------------|------------|
| | 6-8 years (n=166) | 8-10 years (n= 60) | ≥12 years (n=24) | | 6-8 years (n=158) | 8-10 years (n=74) | ≥12 years (n=18) | |
| | No (%) | No (%) | No (%) | | No (%) | No (%) | No (%) | |
| Between 6-8 Days | 133 (80.1) | 48 (80.0) | 24 (100.0) | 205 (82.0) | 23 (14.6) | 12 (16.3) | 3 (16.7) | 38 (15.2) |
| From 8 to 10 | 33 (19.9) | 12 (20.0) | 00 (00.0) | 45 (18.0) | 41 (25.9) | 28 (37.8) | 4 (22.2) | 73 (29.2) |
| More than 10 | 00 (00.0) | 00 (00.0) | 00 (00.0) | 00 (00.0) | 94 (59.5) | 34 (45.9) | 11 (61.1) | 139 (55.6) |

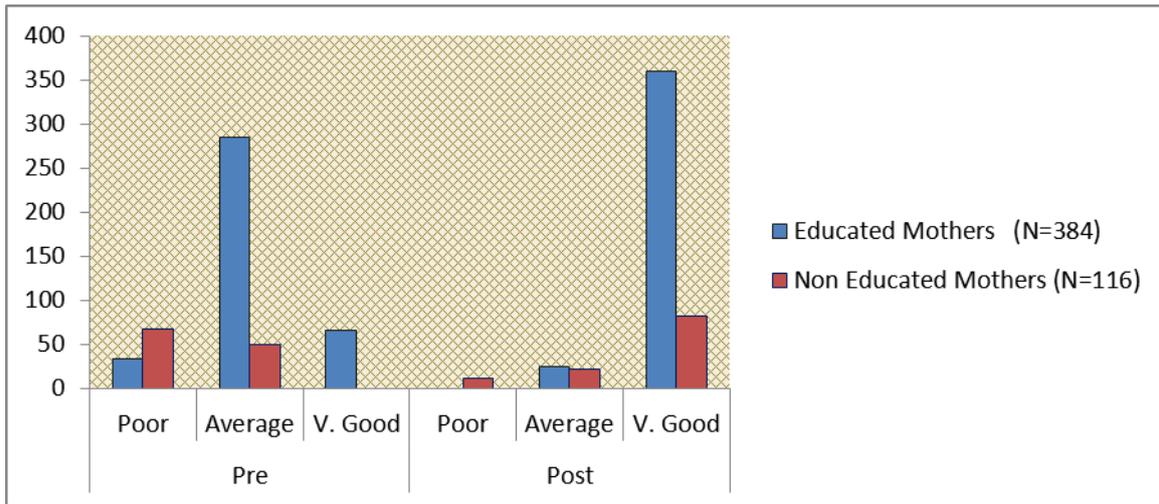


Figure 1. Distribution of Both Groups of Educated and Non educated Mothers Knowledge about Head Lice Pre/Post Application

3.2. Risk Factors

As exposed in Table 2 the students hair was long for more than 20 cm in all aged groups. The table presented that the repeated infection for more than 3 times was commonest among older students ≥12 years (87.5%)(77.8%) among ≥12 years children. Furthermore, the rooms was congested by 2 to 4 persons among all subjects of the study.

3.3. Types of Treatment used before Intervention

It is clear from Table 3 concerning risk factors that all students practiced risk factors as sharing hair combs or brush, sharing beds, using towels with others, sharing head covers especially young children from 6 to 8 years, where majority (72.3%) (78.3%) (71.1%) (74.7%) and (83.3%) (90.5%) (64.6%) (77.2%) in both group display risk factors. Moreover, the situation was little butter among student aged from 8 to10 years and more. Concerning treatment used before the intervention, approximately all students were used licid, vinegar and olive oil to overcome head lice, while more than one-third (33.7%) to (50.0) used Petroleum jelly and none of the sample kerosene.

3.4. Teachers Responses

As displayed in Table 4 it is evident that the majority (100.00 %) of teachers their responses changed to positive attitudes at schools and disagree that the students do not consider dirty if they have lice, they cannot get lice from

pets, an infected student does not withdraw from school, and mothers cannot use available pediculicides to kill all lice eggs.

3.5. The Comparison between the Efficacy of Mayonnaise Versus Hair Shampoo (Table 5)

Additionally, more than half (55.6%) of the student group who used hair shampoo recovered by more than 10 days as compared to none among students group who used mayonnaise

3.6. (Figure 1) Comparison between Mother Knowledge before and after Intervention

To deliver the effect of the of intervention on educating the students and their mothers about lice and its control measures, it is evident that there was highly significant statistically significant differences (p < 0.001) pre/post intervention. wherever majority (93.8%) of educated mothers got high scored post intervention as compared to (17.2%) before the intervention. Also the same situation for non-educated mothers, Where the majority (70.7%) of them got high scored post intervention as compared to none before the intervention.

4. Discussion

Similar to other studies in diverse parts of the world, head lice infestation is a significant health concern that

contributes to morbidity among primary school students in the Kingdom of Saudi Arabia. Head lice can be a frustrating and embarrassing problem. Fortunately, through careful treatment and prevention, lice can be quickly eliminated.

In the present study, the overall prevalence of head lice infestation among school students was high, and the highest among both groups of students were in grades 1 and 2, ranging from 6 to 8 years of age, where more than two-thirds (66.4%) (63.2%) respectively were infected by head lice. As presented in table (1), the prevalence of head lice was common among them. Moreover, about (48.0%) and (52.0%) of the respective families having more than 5 students. [24] reveal that low socio-economic status, poor hygiene conditions and living in congested places lead to extensive prevalence of head lice among school students. This alarming situation indicates that head lice infection in progress, as well as control measures, should be taken into consideration.

Examination of students' hair confirms the progressive relationship between long hair and lice infestation and recurrence. As displayed in Table 2, it was observed that all the students' hair length was more than 20 cm, smooth and shiny in both settings. The percentage was half (50.0%) (49.3%) respectively, of the students aged from 6-8 years and the majority (70.0%) (79.2%) (66.2%) (83.3%) respectively among older students. In addition, more than two thirds (68.1%) (62.0%) (61.7%) (75.7%) of younger students from 6-8 and 8-10 years of age developed head lice infection more than 3 times. However, it was most common (87.5%) (77.8%) among older students ≥ 12 years. Furthermore, the classrooms were overcrowded by 2 to 4 persons for all subjects of the study. This is in accordance with [25] who mentioned that a significant relationship exists between infestation and hair length. It could be that the students and their mothers find it difficult to clean long hair along with the heightened grooming and combing requirements. Longer hair and the crowded classrooms leading to more head contact between students at school may be key factors in high prevalence rates. In the same stream [26] reported that the correlation between hair length and head lice was explored in 14 studies, eight of which reported on the significant impact of long hair.

Furthermore, the present study highlighted the relationship between students' age, risk factors, and treatment used before the intervention, as shown in Table 3. The majority of school students were exposed to risk factors, especially young students, ages ranging from 6 to 8 years, (72.3%) (78.3%), (71.1%) (74.7%) and (83.3%) (90.5%), (64.6%) (77.2%), in both groups. Risk factors included sharing hair combs or brushes, sharing beds, using the same towel with others, and sharing head covers. The situation improved a little among students aged 8 to 10 years and older. These findings agree with [26] who declared that, of 15 studies evaluating the relationship between head lice and shared use of personal hygiene items, eight studies detected major associations between sharing the use of a comb and emergent head lice infestation. It could be due to the increased number of students in one classroom and crowded homes, with most of the families (48.0%) (52.0%) respectively having more than 5 students as illustrated in Table 1.

Concerning treatment used before the intervention, as shown in Table 3 approximately all mothers used lcid shampoo, vinegar and olive oil to overcome the head lice infestation, while more than one-third (33.7%) to a half (50.0) used petroleum jelly and none of the sample used kerosene or carried out such unsafe behaviors.

This assessment reveals the mothers' struggle to find a solution to head lice infestation because of the social stigma related to having active head lice. Although this has little to do with hygienic measures, it does have a distressing effect by isolating friends and families, and creating animosity within school settings. Head lice are more of a frustration than someone else's health problem.

However, it appears, as shown in Table 5, that mayonnaise has the effect of dismissing head lice earlier among all age groups of girls. None of the girls' lice infection lasted more than 8 days. The majority (82.0%) of girls recovered from the infection in 6 to 7 days as compared to only (15.2%) among hair shampoo group in the same age group. Moreover, more than half (55.6%) of the student group who used hair shampoo recovered after more than 10 days, compared to no students in the group using mayonnaise.

Home remedies like olive oil, mayonnaise, petroleum jelly, and tub margarine thick hair gel, have been advised as the treatment for head lice. The use of a heavy coating of such substance to the hair left on during the night will hypothetically block lice spiracles and decrease inhalation. [18] declare that no scientific studies prove the success of mayonnaise as a cure for head lice, at the same time founded mothers using it for a long time and very gratified with its results in homicide the hair lice.

So far, no preventive educational intervention program has been put in place to reduce head lice among schools that have been studied. In this regard, it is worth mentioning that several outbreaks have occurred among school students. Figure 1 illustrates the effect of the distribution of educational material to school teachers, mothers and students on head lice, nit combing, and treatment. Besides intervention educating the students and their mothers about lice and its control measures, it is evident that there were highly noteworthy statistically significant differences ($p < 0.001$) pre/post intervention. This contrasts with [2] and [27] who found that the prevalence of infestations diminished from 44.2% to 7.2% after treatment and the implementation of a health education program [26] indicated that twenty-seven studies which investigated the impact of mothers' education revealed that the risk of infestation by head lice was significantly higher among students whose mothers had low levels of education. After the intervention, the mothers and students reported that they became confident, developed a positive attitude toward hair care and rejected the social stigma that associates infestation with poverty and poor hygiene.

During the intervention at school, it was discovered that there was no school nurse. There was only a social worker, who acted as the liaison between the Ministry of Health staff and schools, and implemented their instructions. As demonstrated in Table 4, after dealing with school teachers, all their responses (100.00 %) changed to positive attitudes at schools and they agreed that head lice are preventable, school students are not considered dirty if

they have lice, lice cannot be contracted from pets, an infected student should not be suspended from school, and mothers cannot use available pediculicides to kill all lice eggs. Moreover, they listed that students became more trusting, confident, happy, and focused in class. This is in agreement with [28] who mentioned the importance of changing teachers' perceptions through the provision of relevant knowledge about head lice.

As a result, these poor conditions and the lack of health education at schools should come to the attention of concerned administrative personnel in order to plan for the recruitment of school nurses. Their recruitment will help overcome universal health problems through health education to promote and maintain healthy behavior, the application of preventive and control measures and invigilation: checkup and follow-up. Knowledge is power, and this is certainly true where head lice are concerned. [2] mentioned that educating mothers and students about head lice myths and truths is a vital issue to eliminate the social stigma. Finally, processes to deal with this vital health problem should take into account environmental risk factors such as the overcrowded classrooms; these issues are as equally important as drug treatment for infestation. The school nurse is the key health professional who is able to provide the education and guidance to the school concerning best practice supervision. Continual school health education programs for preventive measures are essential to limit the prevalence rate, particularly with regard to early detection and effective management strategies.

5. Conclusions

The problem of head lice can be succeeded collaboratively by on-going head lice monitoring by mothers, teachers, and school nurses. Special attention from health instructors can help to establish a supportive relationship and prevent stigmatization. Hoping the application of mayonnaise as natural remedies, effective, cheap, smoothing and nourish hair, safe and time-saving be solving the problem in many schools setting and to decrease treatment burden on Ministry of Health and decrease social stigmatization by the Saudi society.

6. Recommendation

By educating everyone, the school nurse can assist in preventing and dispelling myths regarding lice infection, and end the practice of excluding students from school after head lice treatment. Further studies should address to ensure the effectiveness of mayonnaise in the eradication of head lice.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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